# ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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### Action of the Philadelphia Council in Relation to Electrical Matters.

At a meeting of the Electrical Committee of Councils of Philadelphia, held in Select Council Chamber, June 16, the sub-committee to whom was referred the general ordinances regulating the laying and construction of underground wires, electrical conductors, conduits cables and tubes in the city of Philadelphia, reported the same with an affirmative recommendation. The ordinance was read, and a motion was made by Mr. Hoffman to strike out the clause which requires all corporations to give a bond of $5,000 that they will pave all openings made by them, and keep the street in repair for a period of five years, and substitute $10,000.

"The work will be done under the supervision of the chief of the Electrical Department," said Mr. Lawson, "and very little damage can be done. In my opinion, $5,000 is sufficient."

"All these companies are wealthy," said Squire McMullen, "and they can afford to give a bond of $20,000 if it was required." After some further discussion, the motion was defeated, and the ordinance was directed to be reported to Councils favorably.

An ordinance granting permission to the Electric Pneumatic Transit Company to place pneumatic tubes under a number of streets, was also directed to be reported with a favorable recommendation. The streets under which the tubes will be laid are Library street to Fourth, to Spruce, to Walnut, to the Delaware; on Walnut street to Fifteenth; on Fifteenth, from Carpenter street to Fairmount avenue; on Market, from Fifteenth to the Schuylkill; and on Fourth street, from Library to Callowhill streets, with the privilege of connecting their tubes with buildings along the said streets. The ordinance gives the city the free use of the tubes for the transaction of municipal business. A representative of the company, who was present, informed the committee that it was their intention to commence the work of laying the pneumatic tubes as soon as the ordinance was approved by Councils, so as to complete it during the summer.

The ordinance of the Keystone Light and Power Company to lay conduits under the streets of the city for the purpose of connecting with and furnishing incandescent lights to dwellings and places of business, was also favorably acted upon.

A sub-committee reported negatively on the ordinance granting the Philadelphia Time Telegraph Company the privilege of placing its metallic currents across the highways in the territory bounded by Market and Walnut streets and Delaware avenue and Fifth streets, for the purpose of connecting with all buildings where the tenants lease or use one of the electrical clocks of the company. Charles M. Henry representing the company, stated that it was the intention to furnish electric clocks at the rate of 50 cents per month, and furnish all customers with accurate time by electricity. All the company desire is to stretch a single wire in the territory named.

"I can't see," said Mr. Abrams, "how this Company can have the audacity to come here and ask for an overground privilege when we are doing all we can to get the wires underground."

"They will go under when the others come down," said 'Squire McMullen.

Chairman Graham was also opposed to the passage of the ordinance. He would be in favor of it if the Company was willing to place their wires underground.

After some further discussion, the ordinance was referred to Councils with a favorable recommendation.

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—— A large private electric-lighting installation has just been inaugurated at the London terminus of the Great Western railway. The whole district lighted is 1¼ miles long, and covers 67 acres of ground; 4.115 glow-lamps of 25 candle-power each are used, 93 arc-lamps of 3,500 candle-power, and 2 arc-lamps of 12,000 candle-power. The two dynamos employed are those of Mr J. E. H. Gordon, and weigh 45 tons each, one-half of which is due to the ten-foot revolving magnet wheel, which runs at 146 revolutions per minute. The electro motive force is 150 volts. The mains are all underground, and the glow-lamps are all in parallel arc. Two lines of steam-pipe supply the engines, and a third dynamo is kept in reserve.

### The Schuyler Electric Light Company—Their System of Incandescent Lighting.

Our readers have been pleased to note from time to time the steady progress and the rapid steps into the foremost rank of electric lighting which have been constantly referred to and described in our columns.

Owing to the rapid growth of their arc lighting business, with a few instances of isolated lighting, in Philadelphia and other cities, and the addition of a few small incandescent machines for supplementing the arc lights in their numerous central stations, the Schuyler Company has heretofore made the subject of incandescent lighting necessarily one of secondary consideration.

Their electricians, however, have not been idle in this department, and the company is now prepared to furnish incandescent lights for isolated plants or for central stations.

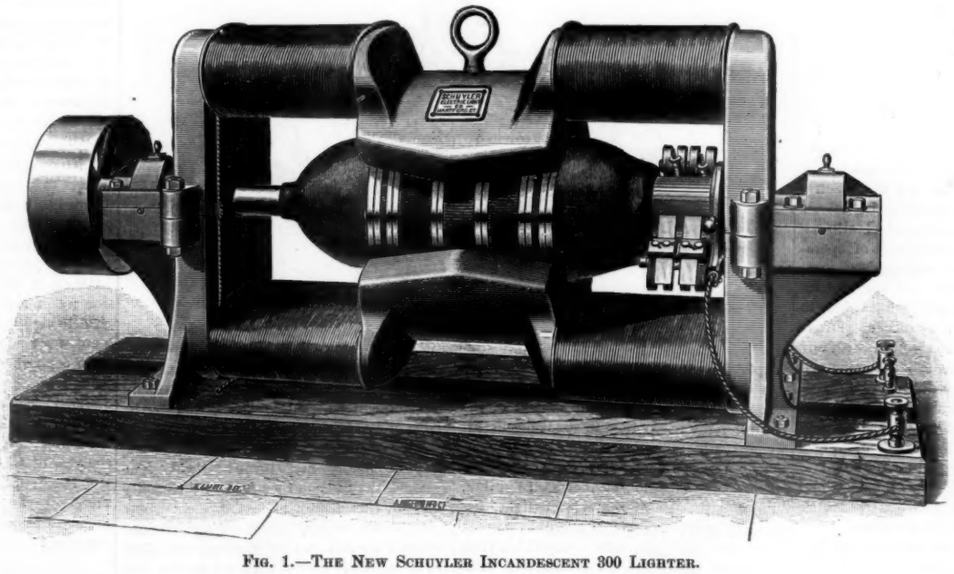

FIG. 1.—THE NEW SCHUYLER INCANDESCENT 300 LIGHTER.

In their new 300-light machine is shown what they claim is the most economical of the incandescent dynamos yet built. These machines are built of either 60 or 100 volts as required. They are of the same pattern as the regular arc machines of this company's make, that is, to say with the drum armature, with the regular self-lubricating boxes. Their tests show that the machine possesses an efficiency of 92 per cent. It has no compound wiring, but is wound with plain shunt.

Every machine is automatically self-regulating at a constant speed, and requires no outside fixtures for governing same. This regulation is so close as to govern the brilliancy of the lamps to within 5 per cent., *i. e.*, if 99 lamps out of 100 are turned out, it is claimed the brilliancy of the remaining lamp would not be increased but 5 per cent.

This machine is built with the new commutator, consisting of a slate center and lignum vitæ division strip between the brass segments. This renders heating of the commutator impossible, and entirely free from sparking. Consequently, the turning of the commutator is rendered very seldom necessary and the expense of a new commutator or repairs of old one almost never necessary. The bearing line will run for weeks without attention

The standard sizes of these machines at present manufactured by the company are of 50, 100, and 300 lamps capacity; they believing that in the majority of cases these sizes are preferable for almost all purposes, but in exceptional cases where for special requirements a larger machine is rendered necessary, the company are manufacturing larger sizes.

The lamps which we also illustrate are of an elegant pear shape, with a graceful filament. They are made to correspond to the requirements in different cases of 60 or 100 volts. The socket commends itself to those using the incandescent lights from the facility with which the lamps can be removed and a new lamp substituted, the lamp simply being held in place by stiff brass springs which fit into a groove extending the entire circumference of the lamp, and the connection being made in the center by means of a spring entirely unconnected with the outside brass ring holding the lamp, thus rendering the connection always certain, and one impossible to weaken with use.

The filament, the manufacture of which is a trade secret, is of a bright gray color, and is as hard as steel. It is of long life, and, owing to the careful assortment in the factory, an absolute uniformity of color is produced in every lamp. The disadvantage of the discoloration of the glass, on account of the depositing of the carbon thereon, has been overcome in this new lamp. The company has adopted the standard of 20 candle-power for their lamp, believing it the most convenient and satisfactory to both manufacturer and purchaser. A very high standard of efficiency has been reached in this lamp, which they state is from 2¾ to 3 watts per candle. This mean figure is found to give a just mean between wants of power on the one hand, and short life on the other. The connection between the lamp and the socket is one in which the lamp can be turned in either direction when cleaned, and produces a better contact the more it is handled.

The new multiple switch, shown in Fig. 4, is one which revolves in either direction, and cannot be twisted off, as is the case in the switches which turn in but one direc-

tion. This switch has a double break of contacts and a quick snap action. All the parts are interchangeable. The handle is insulated, consequently there can be no outside connection, and no unpleasant tingle resulting therefrom.

These lamps can be used indiscriminately on an arc circuit with distribution box, which the Schuyler Company has been introducing for some time, and which we will describe in a later issue. Suffice at present to say that this distributor is now being widely used in the central lighting stations where the company has established its arc lights. Where this distribution box is used special insulated sockets are made for additional safety.

We have only described herein the main features of the Schuyler incandescent system, inasmuch as many additional details, such as safety fuses, etc., have not such an important bearing upon the success of their system as an efficient dynamo, possessing durability in all its parts; a lamp which has a happy mean between economy and life; a socket which admits of the removing of the lamp and the replacing of the same as many times as may be necessary during the entire length of time which the system is used, without weakening or repairing any of its parts, and one which possesses the additional advantages of allowing the entire outer case to be removed without detaching any of the connections, and exposing the entire interior of the socket for examination and cleaning.

In a future issue we will, in addition to describing the distributor which the Schuyler Company have brought out, illustrate a new series lamp for burning on the arc circuit, without any intervening apparatus for distribution.

## "What Must Gas Companies Do With the Electric Light?"

At the second annual meeting of the Ohio Gas Light Association, held at Springfield, Ohio, March 17 and 18, 1886, Mr. T. A. Bates read a paper under the above title. The report of his address as it appears in the *American Gas Light Journal* is as follows:

"The wording of the subject assigned me I take to mean, 'What attitude must the gas companies assume toward the electric light companies to counteract the effects of the opposition of the latter?' I also assume that a statement of results of operations in actual experience is wanted, relegating to each member the duty of deciding for himself (as he assuredly will) what is best to do in his individual case. Certain conditions and circumstances in connection with our business preclude the adoption of any fixed method of procedure, either in details or taken as a whole. Thus it becomes the duty of each company's representative, in listening to the varied—and often conflicting—statements at our meetings, to take these into consideration, to carefully sift them all, and treasure up for future use that which he thinks is most applicable to his needs.

"All are doubtless aware that when the electric light first promised to become a factor in the problem of public and private lighting, every member of the gas fraternity whose opinion we either read or heard of, predicted for it a speedy failure and permanent retirement from the field. You need hardly be told that it has not retired—as yet. Soon the subdivision of the electric current was spoken of, and laughed to scorn. It was nevertheless accomplished; and preparations were made for the manufacture, on an extensive scale, of the pear-shaped bulb, with the hair-like loop inclosed, and with which some of us have become so painfully familiar. But of this, as of other subjects—naphthaline, to wit—it has been my endeavor to avoid that feeling of contempt which too great familiarity usually breeds. At that time, and when the Western Gas Association was in its infancy, an honored member thereof, widely known for his acquirements, asked the privilege of a secret session. There he told us, as a result of personal and thorough investigation, that he was fully convinced the incandescent system of electric lighting had come to stay; that the effect of the new system on the use of gas would be disastrous, and that it were better for us to trim our sails to meet the breeze He also, at the same time, made some very practical suggestions as to how this could be done. To say that, after the meeting, he was (privately) most heartily cursed and condemned is putting it mildly. He would have been called a "Mugwump," had that name then been coined. While it is true his predictions have as yet been by no means fulfilled, still, in some cases, and with some of us here, the prognostication has bordered for a time upon the line of verification.

"I mention this incident (by no means the only one) as showing our intolerance of opinion. If at our meetings we ask for an opinion, and it be honestly given, let us not, because contrary to our own, laugh at the giver.

"Without attempting a compilation of statistics, or bringing forward a mass of figures as proof, I think it would be useless to attempt to deny that the application of electric light is on the increase. In other words, it is to-day used in more cities or towns than was the case six months ago. And it is equally futile to assert that the incandescent system, by reason of its greater adaptability to private lighting, is the more dangerous to us as a competitor than is the case with the arc. When the subject of the electric light as opposed to gas is discussed, we are usually consoled by the statement that, 'While we may have lost some consumers, the demand for increased lighting, caused by the use of the electric light, has more than offset our loss, and that we sold more gas this year, with competition from the electric light, than we did last year without it. This may all be true; but have you kept up the ratio of increase of former years? Further, have you not been forced to make concessions to your consumers other than you would have done but for this opposition?

"I doubt very much if the electric light has proved a blessing to any gas company in whose territory it has located. Neither do I think all gas companies encountering this opposition suffer alike. In the city of 'A' the gas company—while not exactly idolized, as in the city of Richmond, Ind.—may be in very good standing with the people. The electric light company, by injudiciously placing its stock with obnoxious individuals, and by giving an unsatisfactory service to its patrons, may first fail of securing a large consumption, and then weary the patience of those it has secured through the imperfection of the lighting service rendered. In 'B' the conditions are reversed. The most energetic citizens, or those possessed of varied and extensive influence, are secured as stockholders. Every energy is bent, and every influence is brought to bear to the work of securing patrons. To these the company gives a really excellent light—remarkably free from interruption of any kind. Under these circumstances it is not to be supposed the gas management of both places will have like opinion of the opposition.

"Many gas men have a panacea for all the woes of opposition—this is especially so of those who have not yet tasted its sweets; it is good gas and low prices. These are, indeed, excellent cards, but do not always 'rake in the pot.' We have other comforters who are continually telling us (and proving it, too) that electric light—particularly the incandescent—cannot be made as cheaply as gas. With these I have no argument, being of their own opinion; but what consolation is this knowledge to a gas company that, by reason of this opposition, has seen its income growing beautifully less, and its surplus as utterly 'gone' as the honesty of the 'Ohio Boodlers?' I will venture the assertion that there is more than one company in the State that would be in the same position after two years of well-managed opposition.

"Possibly the experience of the company I represent may prove of interest to you.

FIGS. 4 AND 5.—THE NEW SCHUYLER INCANDESCENT MULTIPLE SWITCH AND COVER.

The facts here given have been gathered with care, and the figures will tell, briefly but eloquently, what we have had in the shape of a 'blessing in disguise.' May 13th, '84, the engine of the Circleville Electric Light Company first turned wheel. The system is the 'Edison Incandescent;' capacity of plant, 1,000 lamps. They have now some 1,600 lights wired, about evenly divided between 10 and 16 candle lamps—the plant being worked pretty well up to its full capacity. Up to the 1st instant their charges have not been based on any regular schedule, but claimed to regulate their rates in agreement with those charged by the gas company, and statements made by their consumers are so conflicting that it is impossible to give the prices really charged. Beginning with the first day of March, meters were to be placed, and the charges were to be reckoned as follows:

Electric light equivalent to 5,000 cubic feet of gas, or less.....$2.00 per M.
Electric light equivalent to 5,000 cubic feet and under 10,000.....$1.90 per M.
Electric light equivalent to 10,000 cubic feet and under 20,000.....$1.80 per M.
Electric light equivalent to 20,000 cubic feet and over.....$1.75 per M.

"The gas company has also raised its prices to correspond—charging, however, but $1.00 per 1,000 cubic feet for gas used in cooking, heating, or motive power.

"The light furnished has been very good, and the accidents—so frequent elsewhere—comparatively few. A comparison of the two lights for general effect leads me to the conclusion that the electric light has been more pleasing to the public by reason of the clear whiteness of its rays, and the almost entire absence of heat; but we also find that Hocking coal, with a mixture of 12 per cent. of West Virginia cannel, gives a 19-candle gas that rivals it in whiteness. When burned in a Siemens-Lungren 12-feet burner, the gas entirely eclipses the electric light. As to the relative light-giving qualities, the Rumford shadow test proves the light from a 10-candle electric lamp to be equal to that given from a 5-feet Sugg or Bray fishtail burner. In all candor, I must say our people seem to be well pleased with the quality of both lights.

"The question of the cost of producing the incandescent electric light has been handled by abler persons. Neither can I go into that question with the minuteness I desire. I will, however, give a few figures which I think cannot be successfully disproved. From these your own conclusions can be drawn as to the money made by the electric lighting people. The plant in Circleville represents $10,000 in first mortgage bonds; $15,000 in second mortgage bonds; and $30,000 of stock—in all, $55,000.

"The coal used in the engine room of their works, in 1885, was one-half of 1 per cent. more than all of the coal used at our gas works in the same year, and cost them more per ton. Their receipts, in December last, were less than one half those of the gas company. This would, however, be an unfair comparison for them the year through. They had existing contracts at so much per light per month for the year, while the gas company's receipts are based on actual consumption, and vary, between summer and winter months, 40 per cent. or over. Under the most favorable circumstances, however, we can safely say their receipts were far less in '85 than were those of the gas company, and the latter supplied gas at an average price for the year of $1.12½ per 1,000 cu. ft. If, under this condition, the gas company, with but $26,000 of stock, failed to earn expenses, the dividends of the electric light company, with $55 000 stock and bonds, can be easily computed.

"Now, as to the results of this fight with respect to the gas company. In 1881 it was decided to make such reduction in price of gas, from time to time, as the increased business of the company would justify. In that year the price was lowered from $3.33 per 1,000 cu. ft. to $3. Again, in '83, a reduction was made to $2.60. In '84, before the electric lighting plant went into operation, a cut was made to $2 per 1,000 cu. ft., and from beginning of the opposition operations to end of '84 price of gas was $1.50; from January, '85, to end of September, '85, gas was sold at $1: in October, November and December, '85, for $1.50; or an average for the year of $1.12½ per thousand.

"Theoretically, consumption of gas increases in an increasing ratio with the decrease in price. How did this hold good in our case?

| | Per cent. |
|---|---|
| Decrease in price of gas, '81 | 10 |
| " " " '83 | 13 |
| " " " '84 | 32.66 |
| " " " '85 | 35.75 |
| Increase in private consumption | 6.9 |
| " " " | 10.1 |
| " " " | 28.5 |
| " " " | 9.5 |

Or, as a summary of the five years, we have: Total decrease in price of gas, 66.3 per cent.; increased private consumption, 56.25 per cent.

"The company's income in '85, with increased sales equal to 36.25 per cent., was but 61.75 per cent. of income in 1881. There being no material change in price of coal and labor in this period, it is not astonishing that the company found itself sometime ago without a dollar of surplus.

"I have as fully and briefly as possible given all the facts bearing on this question which were obtainable, or that could be verified. We must now devote a few words to the methods to be adopted to meet the opposition of electric light. To any company threatened I would say—carefully canvass

your town, and if you find your consumer have the electric light fever badly, put in your own plant and give them the light. You can operate it at less cost than any one else; and your surplus (if you have any) is better in this shape than if spent in fighting an opposition company. If you already have the opposition, or decline to act on this proposition, then make a careful examination of the workings of your company. See that the best economic results are obtained; fix the lowest possible dividend your stockholders will accept, put the price of gas at the very lowest rate consistent with making the same; have, then, a committee of influential citizens, or of council, examine your books, and certify to the fact that such figure is the lowest possible one consistent with making a legitimate return on your investment. Publish this report freely in the community; furnish good gas, and leave the rest to time. The American people are credited with the possession of a keen sense of justice, and this will apply to financial as well as to personal privileges. Assure the public you are giving them the lowest rates, and the better element will support you. You will be as sure to see the sale, consolidation, or utter collapse of that opposition as you see day follow night. I must also enter my humble but earnest protest against the suicidal policy of a gas company (at least of the size of the majority of those represented here) putting rates of gas below a living price, and that price based on your present consumption. I say your increased consumption will not (there may be a rare exception) make good a cut of forty to sixty per cent. in your former prices, unless those were extortionate—in which latter case you deserve to be buried under opposition and the curses of the community. I favor low prices for gas, but advise caution in scaling down.

### Good Interior Electrical Work.

The new and magnificent building, 40 and 42 Wall street, built by the Manhattan and Merchants' National Banks jointly, at an expense—lot and all—of about $3,000,000, has just been completely wired for all electrical necessities and conveniences, the contract being done by the Western Electric Company, of this city, under the supervision of Mr. W. E. Gavit. The work is first-class, and in many instances Mr. Gavit has made use of new and original methods which deserve particular mention. In all, there is probably ten miles of wire inside of the building, the contractor having made use of the water pipe flues, six in number, which pass from top to bottom of the building. The telephone wires are incased in speaking tubes, placed alongside of the water pipes and other thickly covered wires, and these being well grounded, induction from any of the numerous strong currents of the telegraph, messenger or ticker wires is completely suppressed. The interior of these six flues are reached on each floor by removing a small section of the wooden casing—a matter of a moment and a screw driver—and the wires properly tagged can be seen ready for use. Every room, through the medium of the flues, is wired for telephone, messenger and ticker service, the circuits of the two latter numbered so a box or ticker can be easily looped in; and at the orifice in the speaking tube will always be found the end of the telephone wire, properly tagged to show its location in the cable box on the roof. All wires are brought to the roof chiefly by cable, located in the terminal boxes fitted with lighting arresters, and then carried to the basement, where they enter the different flues and become useful in supplying whatever form of electrical signalling is desired in the various offices and suites on all the floors. The duty of the lineman ends at the roof, and in each case he has to bring a written order from his company before the janitor will permit him to visit the cable boxes. Once there, a glance tells him the proper connection.

No unsightly wiring is visible anywhere, and by having the entire building fitted by one capable contractor a system has been secured that saves annoyance to every occupant, and delights the electrical companies.

### A Few Figures Relating to Elevated Electric Railways.

*Editors Electrical Review:*

Mr. Woodbury's article on electric elevated railways, in the REVIEW, called to mind a few figures which I made for my own satisfaction, a short time ago, and which may be of interest to your readers:

100 horse-power at 4 lbs. per horse-power per hour. High pressure locomotive engine = 400 lbs. $\frac{1}{5}$ ton at $4 = 80 cents.

FIG. 2.—THE NEW SCHUYLER INCANDESCENT LAMP AND FILAMENT.

FIG. 3.—THE NEW SCHUYLER INCANDESCENT LAMP, WITH CONNECTIONS SHOWN.

100 horse-power at 2.5 lbs. per horse-power per hour. Compound condensing engine = 250 lbs. $\frac{1}{8}$ ton at $4 = 50 cents.

Best dynamos in market working commercially will not return over 80 per cent. of energy (dynamic) expended.

Best motor in market working commercially will not return over 70 per cent. of energy (electrical) expended.

Loss in transmission 15 per cent., resistance etc. Hence:

100 horse-power less 15 per cent. resistance = 85 horse-power less 85 per cent. dynamo loss=72 less 70 per cent motor loss=50.

Hence, to exert 100 horse-power at motor you have to calculate a loss of 50 per cent. Consequently 50 per cent. × 2 = $1.00 cost per 100 horse-power exerted by motor as against 80 cents by locomotive engine.

I am aware that my figures do not agree with those of Prof. Farmer, and others, still I would like some of the interested brethren to point out wherein I am wrong.

Yours truly,

NO AXE TO GRIND.

New York, June 18.

N. B.—Any one replying need not use any higher estimate of efficiency of either dynamo or motor, as I won't believe them.

### A Plea for the Boston Elevated Electric Railway Franchise.

*Editors Electrical Review:*

In your issue of June 12th was printed the testimony of C. J. H. Woodbury before the Massachusetts Legislature's Street Railway Committee, and, as you headed it "An Able Review of the Situation," and speak editorially of Mr. Woodbury as "that able electrical engineer and most excellent authority," you seem to give his remarks your sanction. Moreover, you call them an "unimpassioned and unprejudiced statement of existing and undisputable facts." I beg leave to dispute some of those facts and to assert that if the statement of the case was unprejudiced, it was at least unfair. It seems to me, however, that an unprejudiced witness would not have spoken at length of fruitless inventions of half a century ago without telling at equal length why they were fruitless, and how they have no practical bearing whatever on the points at issue.

But the "undisputable facts" are more important, indeed so important that I request to consider them *seriatim:*

Mr. Woodbury said: "The whole consideration of the practical application of electro-motors has been expressed in the future tense." Yet, while he was speaking, a score of electro-motors driven from a central station were doing practical work within a mile of where he stood, work that was paid for at so much a horse-power. Surely he ought to have known that for many months electric power has been commercially sold in Boston, New York, and foreign cities.

"The hopes of inventors and wishes of capitalists to fill the demands for a practical electro-motor have accomplished little except promises." Yet so practical are some of the motors now in the market that the factories cannot fill the orders fast enough. This shows what power users think of it.

"Electro-motors have been used on numerous short lines of passenger railway in places selected where the conditions would be peculiarly favorable for any street railway." Yet at Baltimore there is a two-mile road with only 300 feet of continuous level; the curves are from forty to ninety feet radius, and the grades run as high as 330 feet to the mile. The route is very crooked. Surely these are not peculiarly favorable conditions.

Mr. Woodbury says it is unproven whether the loss in conversion, transmission and reconversion is not greater than the gain from using stationary engines, and continues: "Certainly such an increase of economy has not been disclosed in regard to any of the small surface street railways in experimental operation. [Notice that the word experimental lets out the Baltimore road, otherwise he would find it hard to explain the fact that it costs on the Baltimore road only $3 per car per day for power, and were there only 50-foot grades it would cost 30 per cent less.] In the famous Port Rush Railway, only one-quarter of the power of the water-wheels is converted into work by the electric motor in practical operation." Yet engineer Traill told the Inventors' Institute last year that the cost of electricity generated by water-power a mile distant was one quarter that of steam used on the same railway.

Mr. Woodbury implies that because it would take 5,000 horse-power to run New York's "L" trains, that might be generated by a single dynamo or by many dynamos connected. He did not even hint that stationary engines, with a few dynamos to every mile of track, might do the work. He ignored the possibility of a single central station with groups of dynamos, each group connected by a separate conductor with a single section of track as long as its machines could work.

The rest of the testimony was devoted to that honorable argument, "Because a thing hasn't been done, it shouldn't be done." Admitting that 95 of every 100 men fail in business, do you tell a man not to go into business?

Because of the delay in the experiments on the New York "L" roads, he argues that an electric elevated railway system is not yet an accomplished fact. So do you, Mr. Editor, when you say, "We hope and expect that some one, some day, will invent an electric elevated railway system." Did either you or Mr. Woodbury ever try to find out the reason of that delay in New York? Did you ever think that it might be the fault of men rather than methods? And would you argue that because a single set of experiments was not pushed to completion, that the thing experimented with was necessarily a failure? I understand that the companies pushing at least two electric railway systems are ready to equip at least one elevated structure whenever it shall be erected, and will guarantee its successful operation so far as power is concerned. The Massachusetts Legislature, no doubt partly because of Mr Woodbury's testimony, have denied these people even the chance to demonstrate their ideas in Boston. If electricians and electrical papers and Legislators everywhere should take the same discouraging position, when will these people ever get the chance?

ROBERT LUCE.

Boston, June 14.

# Electrical Review.

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Another interesting phase has appeared in the Pan-Electric telephone case. The original owners, the Messrs. Rogers, have filed a bill in equity praying for a dissolution of partnership and a general accounting, and claiming damages in the amount of $100,000 from Messrs. Garland, Harris, Atkins, Johnston, and Young. In addition to the claim for damages the bill states that the Attorney General and other defendants have pocketed the great bulk of the cash profits of the Pan Electric speculations, besides about $2,000,000 in the stock of the local sub-companies, and that they have brought the enterprise into disrepute by their underhand methods, and by their cowardly anxiety to screen their own reputations at the expense of the plaintiffs'. The most original and improbable statements that the enemies of the Bell Telephone Company have sent forth concerning that corporation have not equalled the officially admitted state of affairs and designs on the public of the Pan-Electric schemers.

The National Telephone Exchange Association, which meets at the Southern Hotel, St. Louis, Sept. 7th, will be attended by not only a majority of all the Eastern members, but an increase of attendance of gentlemen connected with the Western companies is assured. St. Louis, which is the home of Vice-President Durant, will, no doubt, exert herself to see that these wide-awake visitors are well entertained.

Japan is making rapid strides towards what is considered civilization from the European standpoint. On March 1, by Imperial decree, it was ordered that the "imperial university shall have for its objects the teaching of such arts and sciences as are required for the purposes of the State and the prosecution of original investigation in such arts and sciences."

The Brown Electric Company, whose automatic converter was described in our issue of March 13, have made arrangements for the removal of their works from Chicago to Pittsburgh. They have lately made considerable improvement in their converter, simplifying and perfecting it. It now seems to work to greater advantage than ever. The company are developing their work and promise to occupy what seems to be an important part of the electric lighting field.

The apparent remarkable enlargement of the filament of an electric incandescent lamp on becoming white hot is explained by the fact that when some of the nerve ends of the retina of the eye are excited by light the excitement extends to some degree to the neighboring nerves. Thus a narrow white-hot wire or thread affects, especially from a distance, more nerve fibres of the retina than really receive the light rays, and the sensation is that of a large wire. This is the phenomenon called irradiation.

Colonel William T. Newman, of Atlanta, carries an empty right-arm sleeve. The colonel has a telephone in his office, and was at first puzzled to know how he could pull down the lever, which is on the right-hand side of the telephone. The trouble was overcome by an ingenious contrivance. A string was tied to the lever and a stirrup was allowed to dangle just above the floor. The colonel now pulls down the lever with his foot.

"They have some original characters in these mountains (Maryland and West Virginia). Once I heard a really eloquent sermon at a church 10 miles from Deer Park. But you can imagine my surprise when, in the midst of a burst of rhetoric, the reverend orator clasped his hands in ecstacy above his head, and, lifting his eyes heavenward like a saint, exclaimed: 'My friends, all the world shouted for joy when the good news of Christ's birth flashed over the wires.'"—*Senator Davis of Maryland.*

## *UNDERWRITERS' INSPECTION.*

New York City can undoubtedly lay claim to the most unique method of handling electrical questions of any city in the country.

The system at present in vogue consists in carefully ascertaining whether a man knows anything whatever of electricity. If his ignorance be shown to be complete, then he becomes eligible as Commissioner of Electrical Subways or Inspector of the Board of Fire Underwriters. Why this is thus we don't pretend to say—only such is the fact. As commissioner of subway a moderate degree of ignorance is perhaps excusable, but as inspector of fire risk it is simply criminal. The Board of Fire Underwriters of this city are a reputable body of men, and we would suppose that self interest, if nothing else, would show them the necessity of placing the inspectorships in the hands of competent and entirely disinterested electricians. We contend that an ante-deluvian sea captain, backed by the president of a seventh-rate insurance company, are hardly the men to entrust with seeing that the rules of the board are strictly observed.

## *ELECTRIC ELEVATED RAILWAY.*

We print elsewhere a letter from a correspondent in Boston taking exception to the statements of Mr. C. J. H. Woodbury, in his article on Electric Elevated Railways, and to our editorial comments upon the same—published in a recent issue. We stated that the paper was an unimpassioned, and unprejudiced statement of existing and indisputable facts, and that we hoped and expected that some one would some day invent an electric elevated railway system, and we meant just what we said. So far as we are aware, no one has yet solved the problem of electric propulsion. Every now and then startling articles appear in the daily press, saying that—now we have it; Mr. So-and-So has overcome all the difficulties, and that shortly we will be wheeled along by that wonderful and unseen agency, electricity. By turning to the advertising columns of the same journal we will, as a rule, find that a very limited amount of stock of the So-and-So company can be had at 103 or thereabouts, and that immediate application should be made for the same at the office of Catch-em & Squeeze-em, No.—Wall St., etc. The ELECTRICAL REVIEW wishes here to put upon record that it is not published for the purpose of bolstering any stock-jobbing operation. We, on the other hand, are always ready to aid any legitimate enterprise tending to the advancement of the science of electricity. We should be happy and pleased to record the fact that electric elevated railways were a commercial success, but we can't do it—our conscience will not permit it.

We do not wish to be understood as saying that the projectors of the Boston enterprise were attempting to float a stock-jobbing scheme, for such is not our belief. We are, however, of the opinion that the gentlemen concerned were somewhat premature, and should bear in mind the directions for making hare pie—"First catch your hare."

## *ELECTRICAL NEWS OF THE WEST.*

A fierce thunder shower struck the southern portion of Wisconsin and the northern part of this State on the 15th instant. The lightning was brilliant, the thunder loud and at times continuous. In Milwaukee the signal officers announced a fall of one inch of rain during the storm.

The Milwaukee Telephone Company has recently elected an auditor, Mr. John D. McLeod, latterly with Harrison & Green, railroad contractors at Milwaukee, to fill the place vacated by Will Roberts, who has accepted a position away up towards Lake Superior.

Wednesday the 16th a thunder storm in and around Chicago played some curious pranks in the city. A small frame barn at 372 West Fourteenth street was set on fire, and the entire neighborhood seemed more or less affected by the heavy induction. Miss Kate Shannon, who was in the house in front of the barn, was terrified by the influence, ran to a neighboring house, fell exhausted and fainted, remaining insensible for some four hours and a half. An old lady standing in a house in the rear of the barn avers that the lightning came so near that she thought it struck her, and was so affected as to require her to keep her bed for a couple of days, while a girl of 13 years felt something "creep quickly through her," and burst into tears. Two boys, standing near the barn, claim they were lifted and thrown two or three feet.

The Association of Railway Telegraph Superintendents met on the 16th instant at Hotel Ryan, St. Paul, Minn., President C. W. Hammond in the chair. Matters of particular interest to telegraph and railroad men, such as character, dismissals, application blanks for employes, and especially the best methods of preventing useless telegraphing on railroad lines, all of which questions went into the hands of committees. Additional members, to the number of nineteen, were admitted, and a committee was appointed to report a signal in place of that abomination in the telegraph alphabet which represents the cipher in numerals.

"They fought in the field, and they fought in the hall,
The forests re-echoed their fierce battle call,
Till thousands had fallen, the great with the small,
Why fought they? A zero—just nothing at all."

A. R. Swift, of the C., R. I. & P., was elected president for the coming year; Geo. L. Lense, of the N. Y. & M. E., vice-president, and present incumbent, P. W. Drew, secretary and treasurer; Long, Green and Morely were appointed a committee to select the next meeting point—sort of train dispatchers as it were, to prevent collisions.

The delegates were entertained in the p. m. by the Chamber of Commerce, and in the evening went over to Proctorknottville, late Duluth, as guests of the Northern Pacific and Duluth road.

The new president has a peculiar faculty as an entertainer, and is known to retailers of twice told tales, as the man who carries a chestnut, which he is not at all backward in displaying for the inspection of that class of speakers.

The Mutual Union has commenced its underground work on La Salle street. The route will reach the new North Western offices, and continue to the Illinois Central offices via Lake street. This much accomplished, all their wires on the south will be out of sight for all future time.

Somewhere down in Ohio somebody had trouble with an electric light plant, and sued the company on account of a little difference of opinion as to the necessities of the case.

Mr. Man felt—or his attorney felt—that a small amount of expert testimony from Chicago would be a good thing for him to spring on the defence, and accordingly an affidavit was framed and arranged so that all the expert needed to do was to sign it and hold up his right foot or hand, and say "I do," when sworn. It was so easy, so simple, so thorough.

But the expert had a little time to spare, and read the cunningly devised document before signing, and then—didn't sign.

It stated that in Chicago all the electric light plants were in the business portion of the city, where the noises of the machinery were drowned by the ordinary noises of the street.

It stated that in a residence portion of the city it would be a positive nuisance.

It stated that in addition to the nuisance of the noise, the jar and rattle of the machinery would endanger the safety of the building in which it was placed, and

"Mair of wonderful and awful,
Which e'en to name wad be unlawful."

Before the interview was over the legal gentleman concluded that he could get along pretty well without the expert's testimony.

Grammes & Ulrich, 104 Madison street, are putting in a new Ball unipolar plant of arc and incandescent lights. Mr. Foree Bain, the inventor of the system bearing his name, and who having closed out his connection with that company is now running an electrical business of his own, received the contract for putting in the work, and is doing it in first-class shape.

The incandescent portion of the plant is on the arc circuit, but run through H. P. Brown's converter. Mr. Raymond, of the Ball Company, has furnished a new insulator of his own invention which certainly discounts the drawer knob for inside work. The insulator is of the clamp variety, and the wire may be drawn much tighter than with the knob, while no tie, kink or knot is needed to hold it in position; and when from any cause the line becomes slack it may be tightened without trouble. The whole is arranged too, so that a long or short screw may be used to reach the wood beneath the plaster, and thus make a positive and firm attachment, which is not always a possibility with the drawer knob.

A recent decision of a coronor's jury in

the case of the death of E. B. Schaum, killed by electricity at Pittsburgh, says virtually that "the current was diverted by direct contact of the electric light wire with the awning frame." There is no good reason, no fair excuse now for contact with an awning frame. Every electric light plant should be so arranged that at the light the wires cannot come in contact with an awning frame. It is feasible to raise and lower the lamp without the long loop of wire formerly necessary to this accomplishment.

The Electrical Supply Company at Chicago furnishes a hanger for a very moderate sum which entirely does away with the necessity for those abominable loops, and prevents any such accident as the one above referred to. They will send descriptive circular on request.

Minneapolis is wrestling with the underground problem through its common council.

The recent decease of Mr. C. W. Ross, assistant general superintendent of the Central Union Telephone Company, necessarily deranged the company's distribution of its territory among the superintendents. Mr. C. H. Wilson, who was also an A. G. S., with headquarters in Chicago, has been located at Columbus, much to the dislike of Mr. Wilson's friends hereaway. While these are all anxious for Charley's success in life, and rejoiced at any advancement he may accomplish, there is still a deep and manifest regret wherever the fact becomes known that Charley Wilson has left Chicago. To the people of Ohio, who do not know Mr. Wilson, we can and do cheerfully indorse him as a gentleman in all that the word implies.

Col. Lynch, broker at 146 La Salle street, gives the following as telephone stock values:

| | |
|---|---|
| Chicago | $350 @ $360 |
| Central Union | 45 @ 47 |
| Michigan | 63 @ 65 |
| Iowa Union | 15 @ 18 |
| Great Southern | 29 @ 30 |
| Great Southern, Script, 90 cents on the dollar. | |
| Colorado | 18 @ 20 |
| Rocky Mountain Bell | 40 @ 45 |
| Missouri and Kansas | 54 @ 56 |
| Missouri and Kansas, Script, 55 cents on the dollar. | |
| United | 15 @ 17 |
| Cumberland | 65 @ 70 |
| Wisconsin | 103 @ 105 |
| Bell of Missouri | 147 @ 150 |

CHICAGO, June 21, 1886.

*BOSTON ELECTRICAL NEWS.*

There is a seaside hotel, which we may call by the Norse name of Norumbega, fortunate in a system of electric annunciators and signals. You may call for most anything under the sun, from ice-water to a hack. In case of fire, instructions are given to press the button *nine* times, and if after waiting two minutes an attendant does not come, the signal is to be repeated. This reminds us of a rule in a book on "Emergencies and How to Escape Them," that in case of fire one should put a wet sponge over the face and lie down on the floor and wait for aid.

In the good old times, now long past, the more enterprising of rulers were wont to wander round their capitals in the dead hours of the night, or visit distant provinces with name and clothing changed, and great were the benefits of such supervision to both ruler and ruled. In these days of republican simplicity our legislators travel in palace cars, feast on the fat of the land and never fail to give full information of intending visits, presumably that good accommodations may be provided.

A committee of the Massachusetts Legislature of full-grown men, seventeen strong, made a trip to Edgartown, Martha's Vineyard, and bravely visited the jail. Summoning all the courage they possessed, they were ed around the institution by a little girl. Nantucket, once the queen of the whaling fleet, was next visited, and here they met with better success—the jail had one prisoner, and he kindly led the committee around and explained to them that he had full charge of the institution. The return was successfully and triumphantly made, the entire trip costing about $300. Would it not have been cheaper to have brought the jails, or at least the inmate, to Boston for examination. The Governor might have pardoned the Nantucket man, but perhaps he thought that too expensive, and a watchman for the Nantucket jail must needs be employed. If it takes three days to visit one inmate of a State institution, how long will it take to visit the whole number who board at the State's expense?

A law, passed some years ago by the Massachusetts Legislature, prohibits the manufacture of gas containing more than a specified amount of ammonia, sulphuretted hydrogen and carbonic oxide, and any town in which the gas has been found three times in one year to contain more than the specified are allowed to fine the gas company $100. The law, so far as it referred to carbonic oxide, was designed to prevent the introduction of water-gas, which contains a large percentage of that element. However, as carburetted water-gas has a higher illuminating power than coal-gas, it will be seen that no town would fine a company for making superior gas.

CROSS TALK.—It is whispered that the voting together in the General Court is an example of the influence of induction, the third house often acting as the inductorium; that some thunder storms are needed to produce ozone to clear away the rubbish and give an early adjournment; that the elevators run no faster to give the slow mind time for reflection; that certain gas people are whistling to keep up their courage, and investigating the electric light on the sly; that the man who knows nothing of electricity looks wise and says to his neighbor, "It's in its infancy;" that the consolidation will open the way for the consideration of electro motors for the street cars; that an attendant who tells a visitor to an electric-light station that the friction of the brushes generates the electricity, might profitably study up the subject; that a number of Boston's theaters are considering the introduction of the incandescent light; that a dude, explaining a dynamo to some dudeenes, exclaimed as some oil was put in the cups: "See, the oil is put in there, don't you know, and then is—aw—electrified, and then—aw—goes to the awk light, don't yer know."

BOSTON, MASS., June 23, 1886.

## Electric Light and Water-Gas from the Same Plant—Successful Installation at Cottage City, Martha's Vineyard, Mass.

[Special Correspondent ELECTRICAL REVIEW.]

On the 19th of June the electric light (arc) plant was started at Cottage City under the most favorable auspices. In November, 1885, work was commenced on a water-gas plant of new design, the purpose being to combine the more improved devices of both gas and electrical engineering. During the severe winter the work progressed, and a short time ago gas was supplied to consumers. The holder has a capacity of 40,000 cubic feet, while the generators can produce 150,000 cubic feet per day. An extra number of purifiers is used, so that one or more can always be open for recharging without disturbing the flow of the gas. The system, the invention of Mr. Burdett Loomis, of Hartford, Conn., is a novel departure from the methods hitherto in vogue, and will, by the economy in fuel and attendance, admit of the production of fuel-gas at so low a cost that its introduction for the purposes of domestic heating and cooking, and in manufacturing processes, will be only a question of time. It has long been an established principle in the science of combustion processes that a downward draft through the fire and grate-bars was a far better method of burning fuel than has hitherto been pursued. In the Loomis process air under pressure passes down through the fire and grate-bars, enters the superheaters built of vertical columns of fire-brick, and the waste heat, after doing the work of heating the superheaters, passes through a boiler before entering the chimney. Enough heat in this way is saved to supply all steam necessary for the gas plant and a considerable amount for the electric plant. When the coal has been raised to incandescence, and the superheaters are white hot, steam is admitted to the superheaters, where it is thoroughly superheated before passing into the fire. Entering the lower part of one fire it passes up through it, and next passes through a second, entering at the top and passing out at the bottom, the second furnace thoroughly converting the gases into carbonic oxide and hydrogen gases. The second superheater is now reached, and oil is sprayed into a chamber, volatilized and passed into the superheater. Oil is added only in making illuminating gas. After one run of gas is made the fires are blasted, and steam is now passed into the second superheater first and passes through the apparatus in a course opposite to that in the first run. By the reversal of the current the fires are kept bright, thus utilizing completely the fuel employed, the combustion being perfect. In this apparatus fuel is employed that could not be utilized by any other process—anthracite coal dust, coke breeze (thrown away in large quantities by coal gas companies), bituminous slack and even sawdust. Competent experts, sent here within the last two weeks to examine the apparatus for using bituminous coal for making water-gas, have pronounced it a complete success.

The electric plant consists of two 30-light Ball unipolar dynamos, driven by a slide-valve engine manufactured by Pitken Bros., Hartford, Conn. Two separate circuits are run, amounting, in all, to about four miles of wire. The current developed is eight amperes, and an ingenious indicator, consisting of a vertical solenoid, enables the current to be exactly regulated. In circuit there is included a lamp of peculiar construction, which is placed in the dynamo room. When the proper strength of current is passing through the lamp in the outside circuit, the carbons of this lamp, which is called the "signal light," are close together. When, by an increase in the speed of the engine, or by turning off lights in the circuit, the current increases, the mechanism of the signal light causes the carbons to separate and form an arc, thus introducing sufficient resistance to keep the current uniform. The attendant, noticing the increased brilliancy of the signal light, can, by moving the brushes, reduce the current until it no longer burns. Variations of speed and load are thus compensated for automatically, and as soon as the position of the brushes is changed, an amount of power proportionate to the amount of lights turned out is saved. The power consumed is six-tenths of a horse-power for each 2,000 candle-power lamp. A six-ampere machine of the same type has given, in a recent test, two and one-quarter 1,200 candle-power (half arc) lamps per horse-power, as measured by the dynamometer.

The steadiness of the light was a subject of much favorable comment on the part of townspeople and summer visitors, and the result is the more remarkable if we consider that the motive power is a slow stroke throttle governor engine. This installation deserves especial notice as a pioneer in the field of combined electric and gas plants. The utilization of the waste heat of a gas works for the generation of motive power for a dynamo has here first been realized. The station is so conveniently arranged that one man can manufacture gas till dark, and then run the engine and dynamos, so simple and easy is their management. In many sections of the West bituminous slack can be bought for 50 cents per ton, and at this price for fuel arc lights and fuel gas can be produced at an extremely low rate.

Cottage City, with the combination of gas and electric lights will become one of the most attractive seaside resorts on the Atlantic coast. The Baptist camp meeting at the Highlands, and the Methodist camp at Cottage will be thoroughly illuminated with arc lights. The tabernacle and grounds of the Methodist camp have twelve lights, and whatever may be said on the rostrum, it may be confidently affirmed that the arc lights will not hiss.

## The National Improved Telephone Company Directed to Stop Operations.

Judge Pardee has rendered a decision in the case of the American Bell Telephone Company *vs.* National Improved Telephone Company, on the application of the Crescent City Telephone Company, to be allowed to dissolve the injunction on bond.

The decision is as follows: As intimated on the hearing, the motion to bond the injunction *pendente lite* heretofore issued against the Crescent City Telephone Company must be denied. Considering, however, solely the matter of inconvenience to the public, we think that the said company should have a short delay, say from sixty to ninety days in which to wind up its business, and this we are disposed to grant; provided, however, that said company shall not make any new contracts nor renew any old ones, and shall remove instruments as fast as contracts expire, and that their business shall be, closed up in the time mentioned.

An injunction in favor of the Bell Company and against the Long telephone has just been granted at Parkersburg, W. Va.

## To Record Telephone Messages.

Mr. W. E. Irish, formerly of Sunderland, England, now of this city, claims to have a patent antedating C. A. Bell's, whose invention relating to the recording of sound was illustrated in the ELECTRICAL REVIEW June 12. The claim is made that the Irish invention will record telephone messages, and is an instrument about eight inches high and six inches broad, and can be attached to any telephone. All the mechanism is encased. A call bell and lever to set it in motion are provided. When a person begins to speak into the telephone, the lever automatically starts the mechanism, and a glass pen, freely suspended, is caused to move in unison with the sounds emitted, and to describe them (a special sound alphabet being necessary) upon a reel or on sheets of paper, something after the manner of the submarine cable syphon recorder, a distinct sign being given for every sound. An ink reservoir feeds the pen. The person receiving the message will hear it and also see it recorded at the same time, thus providing a duplicate record. European patents were secured by Mr. Irish in 1884.

## Ozone.

*Editors Electrical Review:*

Mr. W. P. Dewey will, I think, find the undermentioned method a very simple and inexpensive one for generating ozone from phosphorus. Have a shallow glass or ware vessel made with bung hole in the center of the top. The bung should have a tube passed through the center for collecting the ozone as generated. Pour distilled water into the vessel to the depth of half the diameter of the phosphorus intended to be used. The phosphorus should be thoroughly cleaned by scraping before inserting it into the vessel. Ozone will be rapidly generated and may be collected through the tube in the cork. W. E. I.

New York, June 21, 1886.

The public will watch with interest, says the New York *Tribune*, the suit J. Harris Rogers has begun against Attorney-General Garland, Senator Harris and their associates of the Pan-Electric Company, for $100,000 damages and breach of contract. When Railroad Commissioner Johnston, president of the Pan-Electric Company, wrote that "all concerned" were likely "to be considered by the public as swindlers," he realized what was in store for the Pan-Electric statesmen. It is not surprising that men who were ready to deceive the public should play false to their benefactor, Mr. Rogers. They have pocketed some $40,000 in cash, and millions in stock, without any return to Mr. Rogers, though they agreed to get a satisfactory charter. As they failed to do so, he now sues them for damages.

## Telephonic News

⁂ The Metropolitan Telephone Company, of this city, is rapidly increasing its list of subscribers.

⁂ The International Bell Telephone Company has declared a dividend of 3 per cent. on the capital stock, payable July, from the profits of the six months ended June 30.

⁂ It seems that the wire men, particularly the covered wire men, were never busier since they were born. All of which is cheerfully accepted as an indication of the advance of the world electrically.

⁂ A game of base ball between the nines of the telephone and Western Union telegraph companies, at Kansas City, Mo., was played recently, and resulted in a victory for the telephone boys by the score of 21 to 4.

⁂ An item from a Chicago paper is to the effect that the underground wire problem is being speedily solved in that city. The wires are being fast buried, and will all be down by winter; and more significant still, the various electric companies confess that the service is greatly improved by the change.

⁂ Some one writes the REVIEW over the signature of "Station F," New York, to the effect that he had "received money, letters, drawings, etc., from L. H. Everett, the 'latest inventor' of the telephone, long after his attorneys claim that he disappeared.' If "Station F" knows where Lancelot Hope Everett is at the present time, now is an excellent time to let his information be known.

⁂ The activity in the electrical business is well illustrated by the work being done at the branch house of the Western Electric Company in New York City. Over 200 men are employed, and six large floors are occupied by skilled employes. Mr. H. B. Thayer, manager of the New York house, deserves much praise for the earnest and intelligent work he has done here, the results of which are shown in the increasing business.

⁂ Bills in equity have been filed in the United States Circuit Court at Philadelphia on behalf of the American Bell Telephone Company, asking to have the following individuals and firms enjoined from using telephones claimed to be infringements upon the complainant company's patents: Joseph H. Bokel, Savery Bradley, Maurice Hayes, C. J. Heppe, Simon Hochheimer, Paul A. Swartz, David H. Bowen & Son, William T. Dowler & Son, J. P. Matheim & Co., Isidore H. Sultzbach, Cuming & Patterson and Liveright, Greenewald & Co.

⁂ The action of the Council of the city of Indianapolis, Ind., in allowing the Central Union Telephone Company to keep its poles and wires standing till the new telephone company should be ready to come in, has been concurred in by the Board of Aldermen. A lengthy communication was received from the Citizens' Co-operation (Wallace) Telephone Company, through John Caven, president, explaining why it had not made more rapid progress in getting its plant in. It was very difficult to put up poles and wires while those of the Central Union were left standing. A proposition had been made to President Phillips, of the Central Union, looking to the purchase of its plant, but no reply had ever been received to the letter. It took time to prepare the necessary papers, to select a site for an exchange, and to arrange numerous other details. The franchise had been granted only twenty-three days before. The company had supposed the Central Union's plant would be out of the way by June 1. The co-operative company, the letter claimed, was getting ready as fast as possible under the circumstances.

⁂ The New York and New Jersey Telephone Company has gained over 300 subscribers since January 1st, 1886. There seems to be quite a general telephone demand in all the larger cities, and several companies are able to report satisfactory gains.

⁂ By the by is it not remarkable that the mildest of men, men who would not threaten even a boy, will assume the most bellicose tone and most aggressive attitude while talking over a telephone with John L. Sullivan himself? Distance appears to lend not only enchantment, but bravery.

⁂ This week the Bell Telephone Company, by Messrs. Storrow and Dickerson, its counsel, ask the United States Circuit Court at Parkersburg, W. Va., to grant an injunction against the Long Telephone Company. It is said that Chief Justice Waite, will sit in the case. If he should grant the injunction the Government counsel in the Pan-Electric National Improved suit to annul the Bell patent would derive as little comfort from his action as they did from the recent decision at New Orleans. The manufacturer of the Long Telegraph instruments says that the difference between them and the Pan-Electric instruments is so slight that he cannot explain it.

⁂ The Board of Aldermen last night concurred in the action of the Council whereby the city of Indianapolis will be permitted to have the benefit of telephone service, despite the effort to prevent it by an ignorant and corrupt legislature. It has taken the two municipal bodies a long time to reach a conclusion on this matter; but the people are to be congratulated upon the fact that sober, second-thought common sense finally prevailed. Nearly all the newspapers of the city, except the *Journal* did their best to cut off from our business men the use of the telephone, and relegate the city to the ways of village life; but we were unable to see how the indulgence of a stupid, blind rage against a monopoly that the law did not reach, but which resulted in a serious interference with business, was an evidence of anything else than imbecility.—*Indianapolis Journal, June* 15.

### Telephonic Call Apparatus.

This invention, illustrated in this edition, is intended to provide telephone companies with the means of opening call offices for the use of the general public, without having to provide attendants at those offices for the purpose of receiving the payments and regulating the time allowed to each user of the instrument. The expense of this attendant would, in the great majority of cases, completely swallow up the whole receipts from this source; besides, the company would run the risk of being cheated. By the use of this apparatus the cost of providing the call offices is restricted to the value of the instrument and the expenses of collection. Tradespeople, it is thought, will be quite generally glad to have them in their shops for the sake of the customers they attract.

The inventors are Poole & MacIver, of Manchester, England, and the apparatus has been in use since January, 1885, in Manchester, Blackburn, Preston, Dublin, Blackpool, Oldham, Ashton and other places in Great Britain, and has, says *Engineering*, given satisfaction. A large amount of money is collected weekly from these call stations.

FIG. 1.—VIEW OF POOLE AND MCIVER'S TELEPHONE CALL APPARATUS.

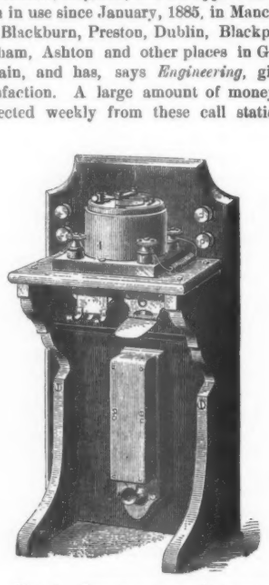

FIG. 3.—INDICATOR FOR CENTRAL STATION.

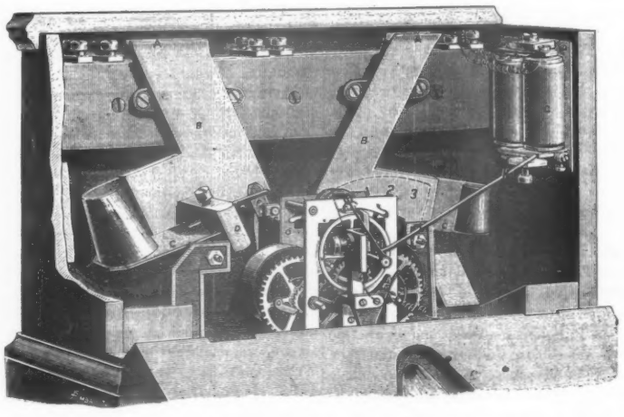

FIG. 2.—INTERIOR VIEW OF POOLE AND MCIVER'S TELEPHONE CALL APPARATUS.

The makers of the apparatus are Smith, Baker & Co., of Manchester.

The usual price charged for three minutes' use of the telephone, when speaking to a subscriber in the same town, is threepence, and when speaking to one in another town, sixpence. The former amount is paid in bronze coins, which are put into a slit in the apparatus, like the opening in a child's bank, and the latter paid in silver and put into a smaller slit. The coins descend through a shoot, and are delivered into a pan on a pivoted beam, so balanced that it will tilt under the weight of the money. If a sufficient weight of coins be inserted, the beam is overbalanced, shooting its load into a drawer, and at the same time moving an electric contact, which connects the local battery to the line extending to the central office. There the current works an indicator to tell the attendant the place from which the call has been received. This indicator is double, and is conducted like a relay, so that a record may be kept, if desired, of the amount of money received at each public call apparatus. The current, which is sent to line by the insertion of the coins into the box, passes first round an electro-magnet. To the armature of this magnet there is attached a lever, which, upon being moved, performs two offices. It moves a pawl round a ratchet wheel a certain distance, and at the same time connects the telephone to line. The ratchet wheel is kept constantly rotating by clockwork at such a speed that it requires three minutes to return the pawl to its original position, when the contact between the telephone and line is broken. During these three minutes the operator at the central station asks the number of the subscriber wanted, and then connects up the lines, if they be free. He then sends a current to the call station, again operating the electro-magnet, and moving the pawl afresh, so that the caller has a clear three minutes in which to hold his conversation, after he is put in communication, and he can further see how the time goes, as a finger connected with the pawl moves over a graduated arc. If the time should prove insufficient, another payment must be inserted into the box, and thus the communication will be automatically restored.

In the engravings, Fig. 1 is a general outside view of the apparatus, showing the slits for the insertion of the money, and the scale of minutes with the finger which indicates how the time is passing. Fig. 2 shows the interior of the box. Fig. 3 represents the indicator at the central station. The money is placed in one of the slits *A A* and runs down the shoot *B* on to the lever *C*, on which it falls flat, and always in the same position. This lever can be accurately balanced by the counterpoise *D* to turn with any desired coin and carries a pin *E*, which normally rests against the spring *F*, and prevents it touching the contact *G*. When the lever moves contact is made between *E F* and a current is sent to the central station, where it is received in the apparatus shown in Fig. 3. This contains a polarized needle which moves to one side or the other, according as the current is positive or negative, and in so doing releases one of the two indicators below it. The same current traverses the electro-magnet *G*, and raises its armature with the long lever *H*. This latter moves the index *I* to the position shown in Fig. 2. This index, together with an arm carrying a pawl and a contact piece, rides loosely on the axis of the ratchet wheel *J*, which is constantly driven round by clockwork. When it is lifted by the electro-magnet, it puts the telephone in circuit with the line, and the connection is maintained until the arm falls back to the starting point. If the operator at the central station should send a current it also operates the electro-magnet and raises the index.

### Services Rendered the Union by Brave Telegraph Operators.

Mr. T. B. A. David, a well-known electrician of Pittsburgh, was one of the five men commissioned by the Government during the war of the rebellion to manage the military telegraph service. He has been anxiously watching the progress of the bill for the relief of the war telegraph operators which was introduced in the early part of Congress. As a commissioned officer, he has no pecuniary interest in the bill, but wants to see it passed for the benefit of those who, while in the telegraph corps of the army, performed strictly military duties, whereby some lost their lives and others were wounded or imprisoned, and who have received no official recognition for their fidelity, intelligence, bravery and efficiency. Speaking on the subject recently, Mr. David is reported, in the Pittsburgh *Commercial-Gazette*, as saying: At the beginning of the war some of the prominent old army officers were opposed to the use of the telegraph, favoring the old courier plan. In constructing the first military telegraph line, we therefore bent all our energies to break down this prejudice, and before I had completed it (following Mc-

Clellan's army into West Virginia) these very men came to me in high praise of its usefulness. They were emphatic as to how impossible it would be to conduct war on a large scale without it. This may seem incredible in our day, but it is nevertheless a fact.

During the war the Military Telegraph Corps, consisting of about 1,200 operators and a sufficient force of line men, built and operated 15,389 miles of telegraph lines exclusively devoted to military purposes. In addition, many lines of commercial companies were temporarily, from time to time, made use of by the Government. When McClellan sat before Yorktown the wires became his trusty sentinel. It was at this place that a well-known operator, Mr. Lathrop, was killed by a torpedo. The wires followed McClellan into the wilderness, and threatening the forests and swamps of the Chickahominy by day and night, kept him advised of events, and made known at Washington by frequent daily telegrams his hopes, his fears, and his wants. Here the field-telegraph was first practically tested for tactical purposes, and here at Gaines' Mills it saved the Union army from utter rout. From Harrison's Landing it maintained communication with the North until the army went to reinforce Pope. It followed McDowell's co-operating force to Fredericksburg; Banks up the Shenandoah, and Fremont in the Alleghenies, and enabled them to co-operate to drive Jackson out of the valley, and protect Pennsylvania and Washington. It followed Gen. Cox to Gauley Bridge, W. Va., and via. Raleigh to Princeton, and it brought Federal Gen. Morgan operating against Cumberland Gap, Ky., into the telegraphic union, and soon kept that Sebastopol of America in communication with Buel at Shiloh, via Lebanon Junction, Ky., and Nashville, and announced the defeat of Beauregard's army.

STRETCHED LONGER AND LONGER.

It followed Foote to Fort Henry, and Grant to Donelson, whence it was extended, making two routes to Nashville. The corps quickly gladdened the Union people with Mitchell's wonderful successes in Northern Alabama, and enabled him to capture valuable railroad trains by false telegrams transmitted over Confederate wires, by means of which eighty-four miles of Memphis and Charleston Railroad were captured in a few hours, and Corinth and Chattanooga menaced. It was by the use of the telegraph that Grant at Jackson subsequently overlooked affairs in his department, prepared Rosencrans for his splendid defense of Corinth, and brought Ord to Bolivar to co-operate with McPherson from Jackson in the pursuit of Van Dorn's defeated army. Even Curtis, at Pea Ride, Ark., was but a few miles from the telegraph builders who were rushing their work with the greatest rapidity, while he was fighting a magnificent battle. After completing this line, that from St. Louis to Pilot Knob, Mo., was extended over 200 miles to Batesville, Ark., Curtis' new base. Thus all along the armed front sped the electric tongue. Over 4,000 miles of military telegraph were in operation, embracing parts of the States of Pennsylvania, Ohio, Indiana, Illinois, Maryland, Delaware, Virginia, Mississippi, Arkansas, Tennessee, Kentucky, Missouri, Kansas, and soon after also North Carolina, Louisiana and the Indian Territory.

THE BRAVE OPERATORS.

By the efforts of personal friends the history of the telegraph operators has been collected, and it is known that of the entire number 199 were either killed, died of disease, or were captured while in the line of duty. It is estimated that more than 100 others suffered from the casualties of the service. The fact that at least twelve members of the corps were killed by the enemy; that probably fifty died in the service; that not less than ten were wounded and fully 200 captured, attest, beyond question, the danger incident to service in the military telegraph corps of the Union army in the war of the rebellion. Of the 1,150 operators engaged in and surviving the service, notwithstanding the remarkable facilities they have enjoyed for keeping track of one another, and nine years' effort to find their comrades, they do not know that four years ago when a society was organized there were over 440 alive.

INSTANCES OF HEROISM.

One of the operators who remained at his office in Winchester, Va., until the retreating Federals had nearly all left, was himself about quitting, when he received a telegram from the commander for Harper's Ferry calling for re-enforcements. His stay to transmit that dispatch resulted in his capture and imprisonment in Libby Prison. For years he has been suffering from the effects of his imprisonment and is in daily fear of the third stroke of paralysis.

It was believed that Gen. Porter was saved from defeat by the bravery of an operator who connected his instrument with the field-line during the battle of Gaines' Mill, and with only a tree to shelter him from the storm of bullets and shells, sent and received many dispatches whereby Gen. McClellan was enabled to re-enforce Gen. Porter most opportunely. Several of the operators' orderlies were shot, and messages had to be sent by two or three messengers to insure delivery.

In 1880 Gen. G. K. Warren wrote: "I often talk with those who were with me of the operator who, in the first of our attacks on Petersburg, brought his wire to the front under musket range of the enemy and operated it behind a tree that proved to be hollow, and which any of the cannon shot, which were at close range and flying fast, would have gone clear through with little loss of force; and, again, of the one on the Weldon Railroad on the Sunday morning we were shelled out of it, both from the north and west, and who worked his recorder in a southeast angle, and outside under the musket fire that, by its sound so near and the pattering of the balls around, confused the records of his sounder, and many others on other occasions. So I have always felt a great deal for their heroism."

Yet another who helped to construct a line from Fort Saunders to College Hill, at Knoxville, Tenn., during the siege, when he received four bullets through his clothes, and one through his hat, and for his bravery was brevetted captain by Gen. Burnside, in consequence of exposures in East Tennessee, has been an intense sufferer from rheumatism, partial paralysis, pains in the head, and is almost blind. His devoted wife is his only support.

Another, in the Department of West Virginia, enlisted in an Indian regiment for three years, but was furloughed to serve in the telegraph corps, in which service he continued after his term of enlistment, and was captured at New Creek Station. He was in Castle Thunder four months, "half clothed and two-thirds starved," which so shattered his system that he has ever since been unfit to do much manual labor.

Another, from the Department of the Gulf, whose horse during the siege of Port Hudson was twice shot under him, and whose field office was just behind an Indiana battery, where for many hours he was under fire from the enemy's guns, has for years been unable to support his family at his former business, though he was an expert, and is now struggling on a far Western farm under discouraging physical and consequent financial troubles.

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.... W. E. Flippen, the present manager of the Western Union Telegraph office in this city, says a Vicksburg writer, took charge of the office twenty years ago yesterday, and during the entire time, with but two very short periods of rest, he has been steadily at his post. During the dark and gloomy days and nights which surrounded us throughout the terrible yellow fever epidemic, from July to November in 1878, he never deserted his keys for a single day, and while all the other operators who were sent for duty or volunteered their services were stricken down by the fell destroyer, he alone was spared, and conducted the company's business, receiving his meals and sleeping in the office. So highly did the citizens of Vicksburg appreciate the services of this gentleman during those trying times that they presented him with a diamond medal.

**Underground Conduits in San Francisco.**

The matter of underground conduits for electric lighting was recently considered by a committee composed of the San Francisco council, Councilman Kunkler presiding. At the lower end of the table was placed a contrivance of two iron pipes fixed one over the other, looking like an improved Nordenfeldt gun or an infernal machine, and Kunkler looked quite relieved when he left that end of the table for the chair. The machine proved to be harmless, and only a model for an underground conduit for electric wires.

The clerk read the communication from George S. Ladd and John I. Sabin, recently published in the *Report*, in relation to the work of the committee appointed to inquire into the proposed scheme for laying all electric wires throughout the city under ground. The report advised the board to wait until the various systems now being tried in Boston, Pittsburg, New York, Chicago, and Washington had been properly tested.

He also read a communication from A. F. McGrew, the inventor of the underground conduit, of which a model was before the board.

McGrew, F. Pope-Cox and Horace Pratt, representing the San Francisco Underground Conduit Company, argued in favor of the granting of a franchise to lay the conduit in question in the streets. They believed it would be a success and said it would require at least five miles of piping to thoroughly test the invention. They claimed that it was similar to the underground conduit now working satisfactorily in the cities of London and Plymouth, England.

On the other hand, Frank Jaynes, on behalf of the Western Union Telegraph Company, and George S. Ladd, for the telephone companies, maintained that the conduit in question was of no use, and that if the franchise were granted the streets would be torn up for nothing. If the board waited until the experiments now being made in many large cities were concluded there was every reason to believe a well-tried and satisfactory underground conduit would be found.

P. B. Cornwall and E H. Roe, of the Electric Light Company, were present, but did not take any part in the discussion.

Abbott asked whether an application had been made to buy this patent in other cities, and F. Pope-Cox stated that as yet it had not been tested.

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**Railway Telegraph Superintendents.**

The Association of Railway Telegraph Superintendents met June 16 at the Hotel Ryan, St. Paul, Minn. President C. W. Hammond, of the Missouri Pacific, presided. The association discussed matters particularly interesting to telegraph and railroad men, such as the character of dismissal and application blanks for employes and the best means possible to check useless telegraphing on railroad business, which matters were referred to committees. The greater portion of the morning was used in discussing these questions. Nineteen new members were received. A committee was appointed to report at the next annual meeting some new signal for cipher in the place of long dash. A. R. Swift, of the Rock Island Railway, was elected President for the ensuing year, Geo. L. Lenz, of the New York and New England Railroad, was elected Vice-President, and D. M. Drew Secretary and Treasurer. The delegates left at night on an excursion to Duluth as the guests of the Northern Pacific and Duluth Roads. The selection of Mr. Swift as president is an admirable one, as he is one of the oldest and best informed railway telegraph superintendents in the country, and besides one of the handsomest.

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.... The Philadelphia *Press* finds cause for congratulation in the disappearance of another toll-bridge from Pennsylvania. With toll-bridges are also going in great degree the toll-takers of commerce. Cotton is now bought and sold by cable between Manchester and the interior of Texas on through bills of lading. And this fact but illustrates the completeness with which old frontiers are being broken down by those wonderful levelers, the locomotive and the telegraph.

## TELEGRAPHIC

.... George W. Babbit, of St. Thomas, train dispatcher of the Michigan Central Railroad, has been elected president of the Train Dispatchers' Association.

.... The John Scott medal and prize of the Franklin Institute has been awarded to Mr. Lucius J. Phelps, the inventor of the Phelps Induction Railway Telegraph System, now in use on a branch of the New York and New Haven Railway. This is a deserved recognition of Mr. Phelps' work.

.... Superintendent Frank Mason of the Police Telegraph Bureau, Brooklyn, was notified that there was a registered letter awaiting him at the Post Office in that city. On calling at the office and receiving the letter he found that the envelope had been cut open across the back, and that while the letter called for $55, there was only a $50 note enclosed. The postmaster told Mr. Mason that it was very lucky for him that the thief had been satisfied with the smaller bill of the two.

.... An inspection of the new electric fire alarm system at Augusta, Ga., was recently made by the city authorities, and everything found to be in first-class condition. Chief Platt is to be congratulated on his success in procuring the Gamewell system for Augusta. It will be a great convenience, and will enable the firemen to arrive at the scene quickly, and will not cause the unnecessary delay of running all over the city looking for the fire. With this system they know, as soon as the alarm is sounded, almost exactly where to find the fire.

.... Mr. Paul W. Bossart will make his headquarters in Chicago hereafter, having taken general charge of all territory west of Pennsylvania for the purpose of introducing the "Phonoplex," the new system of duplexing way stations. At the present time he is putting in these instruments on five circuits for the telegraph department of the enterprising Atchison, Topeka and Santa Fe Railway Company. Mr. R. B. Gemmell, superintendent of telegraph for this company, has one of the most complete systems in the country, which he has built up in the far western country, where such improvements are not generally looked for.

.... Professor George L. Vose, whose manual on railroad engineering is authority the world over, was one day puzzling over the time-card on the wall of the Boston & Maine station, without making out what he wanted to know, when the president of the road, Mr. Furber, came by and accosted him. "I am very glad to see you," the professor said. "I wish you would help me out with this time-table. I cannot make head or tail out of it." The president joined in the investigation, and for some moments the pair floundered about among a. m.'s and p. m.'s with no satisfactory results whatever. "Oh, I never can make anything out of these things," President Furber exclaimed at length, "Let's ask somebody!" And they went and asked a brakeman.

.... In Vienna, there were recently exhibited gas and water service pipes made of paper. The same kind of pipes, it is claimed, will do for many factory purposes, and for laying electrical wires. The pipes are made as follows: Strips of paper are taken, the width of which corresponds with the length of one pipe section. The paper is drawn through melted asphalt, and wound upon a mandrel which determines the inner diameter of the pipe. When the pipe thus made has cooled, it is pulled off the mandrel, and the inside is covered with a kind of enamel, whose nature is kept secret by the makers. The outside is painted with asphalt varnish, and dusted over with sand. It is stated that such a pipe will resist some 2,000 lbs. internal pressure, though the thickness of the stuff is only about half an inch.

## ELECTRICAL AND SCIENTIFIC

* * A correspondent asks: "How can I prevent communications intended for the editor only from getting into print?" Write on both sides of the paper.

* * There is a cave about four miles from Houston, Texas, about 100 feet long, 60 feet broad, and from 4 to 16 feet in height, where numberless bats roost by day. It is said that there are so many that it takes them nearly an hour to get into the cave each morning, and in the rush hundreds are killed. It is proposed to form a company to collect and utilize batskins.

* * Thirty-five business men who daily travel between Boston and Falmouth, on the Old Colony road, by paying $100 each in addition to the regular fare, have secured the exclusive services of a train that is said to make the fastest time in America. The journey usually requires three hours, but "The Flying Dude," as the boys call it, can do it in one hour and ten minutes.

* * Messrs. F. Hembert and Henry say, in *Comptes Rendus*, 101, 898: Steam is first decomposed by passing over incandescent coke. The mixture of hydrogen and carbon monoxide is then put in contact at a very high temperature with steam, which decomposes and yields $CO_2$ and H. A ton of coke gives by this process 3,200 cubic meters of hydrogen. The cost per cubic meter would be 0.015 franc (less than one cent for three cubic meters).

* * Mr. John Ewell, the restaurateur, corner St. Paul and Baltimore streets, Baltimore, is the first person to adopt the Edgerton electric motor to run the fans used to cool his establishment. The motor is a quarter-horse-power machine and drives two fans, although the same amount of electrical force can be used to drive four times as many fans. The motor is run by the current of the Brush Electric Light Company, which costs $20 a year. The apparatus costs $50.

* * The latest victory in the long-drawn match between the gun and the armor-plate has been scored in favor of armor. At Spezzia, a German chilled steel armor-plate, 5 feet 9 inches in thickness, weighing 100 tons, was fixed against the face of the cliff, and battered with chilled shot from the 100-ton gun. A thunderbolt, weighing almost exactly a ton was hurled against the face of the plate by the explosion of 7½ cwt. of powder without producing more than a slight indentation and some trifling cracks. Three shots failed to make any serious impression on the plate.

* * A novel manner of putting an end to the torture of a neighbor's piano was invented by a German. A large electro-magnet was put into the room of the tortured savant and connected with an electric battery. Its poles were put close to the wall against which stood the piano of the next house. When a stream of electricity was turned on the steel strings of the piano became affected and the instrument was put out of tune. This happened whenever the victim of the piano plague was in his room; when he went out, and the electric stream was stopped, the pianist could play.

* * From Nelson, New Zealand, we learn of a curious association of native copper, says the *Engineering and Mining Journal*. At the Champion copper mines the copper ore occurs in the fissures of the alumina-magnesia silicate (no lime), which is called there serpentine. And native copper is found filling all the fissures in the white iron pyrites, making it almost impossible to break such pieces with a hammer. These pyrites themselves contain only from ¾ to 4 or 5 per cent. of copper. There are also good copper pyrites in the vein; but the native copper is rarely found in them, but is confined almost exclusively to the poor white pyrites.

### Explaining the High Price of Copper.

*Editors Electrical Review:*

The article in your issue of April 24, from the *Manufacturers' Gazette*, showing how electrical development has been retarded by the high price of copper, deserves the careful consideration of all who are interested in electrical development.

The superiority of electricity for illumination purpose is unquestionable. The only drawback is the cost. Inventors are working night and day to devise means to reduce the cost of electric lighting, electric motors, etc. The repeal of our tariff laws would do more to reduce the cost of the erection and maintenance of electrical plants of all kinds than our inventors can hope to accomplish during the next twenty years. The duty of four cents per pound on copper is only one of the many obstructions placed in the way of electrical enterprise by the Government for the purpose of enriching a few grasping monopolists. High rates of duty are placed on coal, iron, steel, copper, glass, silk, and many other articles which enormously increase the expense of building and maintaining telegraph, telephone and electric light plants. With your permission I would like to give a few facts in regard to the copper monopolists for whose benefit the duty on copper is maintained.

While we have in this country the richest copper mines in the world, copper is dearer in the United States than in any other country. The people of England can buy Michigan copper in England much cheaper than the people of Michigan can buy it. The Calumet & Hecla Mines were discovered about 20 years ago. The capital stock is $2,500,000, of which less than a million is paid in. There are 100,000 shares of $25 each. On this investment of less than $1,000,000 over $27,000,000 have been paid in dividends. In addition to the above an enormous sum has been expended in improving the plant, all paid out of the earnings of the mine.

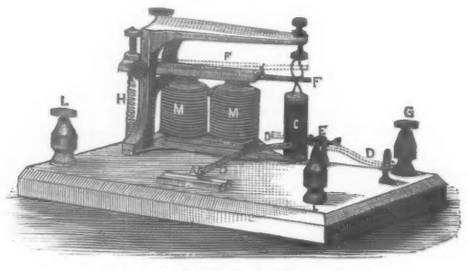
This is a sample of the protected infant industries that are draining the pockets of the people to make millionaires of a few.

M. G. BROWNLEE.

Detroit, June 17.

### Radiguet's Battery.

We are often asked what system of domestic electric lighting we would recommend. As long as a distribution of electricity to houses is not carried out, we must not, with the present resources of physics, think of practically and economically lighting an entire apartment by means of primary or secondary piles; but we can obtain a momentary partial illumination that is capable of rendering the greatest services. A battery of six elements is placed in a room in our garret. From this two wires run to our apartments, and are connected with incandescent lamps located in the different rooms. In the evening, on entering the dark antechamber, a commutator permits us to light up the latter. Then, opening the parlor door, we touch a button and light up the room and extinguish the lamp in the ante chamber. The same maneuver is performed for crossing our study in order to reach our bedroom. In addition, incandescent lamps are placed in a dark closet filled with books, in the water closet, etc. The same battery suffices for all this lighting, although the latter is not continuous, but is only used for a few minutes at a time in one room or another, in order that a match may be found, a visitor shown out, etc. The cell, which is of the Poggendorff type, consists of an external vessel of glazed pottery of good quality, containing a concentrated acid solution of bichromate of potash, and of a carbon cylinder whose top is paraffined. This cylinder contains a porous cup whose top and bottom are paraffined, which is filled with water acidulated with one-tenth part of sulphuric acid by volume. The zinc which this cup contains remains constantly submerged, and its lower part dips into mercury contained in a cup with sloping sides. It is due to this latter that the zinc can remain submerged without wear in open circuit. If we were content to pour the mercury into the bottom of the porous vessel, it would not only require the use of a large quantity of it, on account of the concave form of the bottom, but, after a few hours' operation, the mercury would be found to be covered with sulphate of zinc, which would finally adhere to the mercury and zinc, and entirely cover the former metal. At the place where the mercury and zinc were in contact, a kind of soldering would occur that would entirely suppress the said contact and prevent the mercury from entering the pores of the zinc—Mr. Radiguet's cup remedies this trouble; since, as the sulphate of zinc formed slides over the external surfaces, the mercury remains clean and in constant contact with the zinc. The acidulated water in the porous vessel is changed every fortnight, or after seven or eight hours of lighting. The same bichromate may be used for four charges of the porous vessel—say for about thirty hours, since the lamps consume but one ampere. The six elements of this battery allow us to operate incandescent lamps of three-candle power.—*La Nature.*




HOREN'S LIGHTNING ARRESTER.

### Horen's Lightning Arrester.

The cut on this page illustrates a lightning or strong current arrester, invented by John Horen, of Omaha, Neb., and which is now working on a Weston dynamo in that city, and giving satisfaction. Following the letters, *M M* is the magnet, which attracts the armature *F* when the current is on and the dynamo running. By the downward motion of *F* and its extension working in the spiral cam of the cylinder *C*, the cut-out arm *D* is turned to position and set to proper adjustment to conduct lightning to ground. This arrester makes it impossible to short-circuit the current of dynamo on the arrester, as one is placed in circuit on positive side and one on negative side. If the current is caused to jump by lightning or other cause to the ground of arrester, the cut-out instantly throws off the ground and causes the current to travel its original circuit, and also arrester assumes proper position. *H* is spiral spring, which throws *F* upward when released by *M M*; *A* is ground contact; *B* is line at ground contact—this space between is adjustable also; *G* is ground binding post; *L L* line binding posts.

This arrester, the inventor claims, can be used with absolute safety on all dynamo machines, any make or size.

*** The Mexican Central Telegraph and Telephone Company has declared a dividend.

### Comparison of Ordinary and Metric Units.

The subjoined tables, prepared by Mr. Frederic Brooks, of Boston, will be found useful as showing relation between and approximate equivalents of ordinary and metric units:

*Length.*

| | | | | |
|---|---|---|---|---|
| 1 inch | and | 2½ | centimeters.... | (2.54) |
| 1 foot | " | 0.3 | of meter..... | (.3048) |
| 1 yard | " | 0.9 | " meter..... | (.9144) |
| 1 rod | " | 5. | meters..... | (5 029) |
| 1 chain | " | 20. | " ..... | (20.117) |
| 1 furlong | " | 200. | " ..... | (201.17) |
| 1 mile | " | 1600. | " ..... | (1609.3) |

*Area.*

| | | | | |
|---|---|---|---|---|
| 1 sq. inch | and | 6½ | sq. centimeters | (6.451) |
| 1 sq. foot | " | 0.09 | of sq. meter.. | (.0929) |
| 1 sq yard | " | 0.81 | " " " .. | (.8361) |
| 1 sq. rod | " | 25. | sq. meters.... | (25.29) |
| 1 rood | " | 1000. | " .... | (1011.7) |
| 1 acre | " | 0.4 | of hektar..... | (.4047) |
| 1 sq. mile | " | 256. | hektars ..... | (258.99) |

*Weight.*

| | | | | |
|---|---|---|---|---|
| 1 grain | and | .06½ | of gram. | (.0648) |
| 1 troy ounce | " | 30. | grams... | (31.103) |
| 1 avoir. | " | 27. | grams... | (28.35) |
| 1 pound | " | 0.45 | of kilo.. | (.4536) |
| 60 lbs. (wheat bu.) | " | 27. | kilos. . . | (27.216) |
| 80 lbs. (coal bu.) | " | 36. | " .... | (36.287) |
| 1 cental | " | 45. | " .... | (45.36) |
| 112 lbs. (cwt.) | " | 50. | " .... | (50.8) |
| 1 net ton | " | 0.9 | metric ton. | (.9072) |
| 1 gross ton | " | 1. | " . | (1.016) |

*Bulk.*

| | | | | |
|---|---|---|---|---|
| 1 cu. inch | and | 15⅝ | cu. centimeters. | (16.387) |
| 1 cu. foot | " | 0.027 | of cu. meter. . | (.028316) |
| 1 cu. yard | " | 0 729 | " " .. | (.7645) |
| 100 cu. feet | " | 2.7 | cu. meters... | (2.8316) |

(The unit of ship's measurement for register.)

| | | | | |
|---|---|---|---|---|
| 1 M. board meas. | and | 2¼ | cu. meters. | (2.36) |
| 1 cord | " | 3.6 | " " | (3.624) |
| 1 U. S. liq. pint | " | 0.45 | of liter.... | (.473) |
| 1 " " quart | " | 0.9 | " liter.... | (.946) |
| 1 " " gallon | " | 3.6 | liters..... | (3.785) |
| 1 peck | and | 9 | liters | (U. S. 8.81; Br. 9.08) |
| 1 bushel | " | 36 | " | (U. S. 35.24; Br. 36.35) |

1 ton of ship's displacement.....1 cu. meter.

Combinations.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 foot-ton (net) | and | 0.27 | of (metric) ton-meter ..... | (.2765) | Wt. and length. |
| 1 foot-pound | " | 0.13½ | " kilogrameter..... | (.13825) | |
| 1 pound per running yard | " | ⅔ | kilo per running meter..... | (.4961) | Wt. per length. |
| 1 " " " foot | " | 1½ | kilos " " ..... | (1.4883) | |
| 1 " " sq. foot | " | 5 | kilos per square meter..... | (4.888) | Wt. per area. |
| 1 net ton " " | " | 1 | kilo per sq. centimeter..... | (0.9765) | |
| 15 lbs. " " inch | " | 1 | " " " ..... | (1.0545) | |
| 1 pound " " | " | 1.07 | kilo " " ..... | (.07031) | |
| 1 net ton " " | " | 0.14 | metric ton per sq. centimeter. | (.14062) | |
| 1 pound per cu. foot | " | 16 | kilos per cu. meter. ..... | (16.019) | Wt. per bulk. |

*** An indication of the demand for telephones in Indianapolis is shown by the fact that all in stock were exhausted the first day after the council granted the Central Union Company the privilege of continuing business under the toll station proposition. New telephone sets were telegraphed for, and as soon as received were put into places that had already contracted for them.

### Electricity in the Royal Navy.

Our London namesake says that the 150 members of Parliament who, with Captain Lord Charles Beresford as their *cicerone*, visited Portsmouth recently, had an opportunity of witnessing some interesting submarine and electrical experiments, which, though not at the present time of a particularly novel description, serve to mark the rapid progress which has been made in electrical science as applied to naval warfare since the last visit of representatives of the Lower House, now some eight or nine years ago.

The morning having been devoted to a sham fight at Whale Island, the M. P.'s proceeded, after lunch, in dockyard tugs to Porchester Creek, where, under the superintendence of Captain A. J. Fisher, of Her Majesty's gunnery ship Excellent, assisted by Commander Macleod of the same vessel, an interesting programme was carried out, to the manifest amazement of some of the visitors, whose Arcadian simplicity with regard to naval matters afforded no end of amusement to those whose education has been more complete in the matter. The old-fashioned outrigger torpedo boats, in which electrical apparatus was made use of, although not to the same extent as in the newer type of craft, afforded a striking proof of what has been accomplished in a comparatively short time. These boats were very carefully maneuvered, and the *modus operandi* of their attack succintly explained. Another operation was destroying electric cables and "bumping" submarine mines. This is one of the latest developments of naval warfare, and was effected by means of a bulky and far-reaching apparatus being dragged over the torpedo grounds by a steam launch, which keeps at the distance of about 500 yards away. On the first mine exploding, the electric cables connecting the others were so affected that they also were destroyed. After this, attention was directed to a second-class torpedo boat coming from the head of the harbor in the direction of the tugs in which the "members" were accommodated, at a furious speed. Without slackening, a torpedo was shot out at right angles and struck the target. A first-class torpedo boat afterwards fired two of her deadly charges simultaneously, and both were very near the target. The improvements which have been made of late in the mode of discharging torpedoes by means of electrical apparatus has greatly conduced to a greater degree of precision in aim being attained, and with still further developments in this direction there can be little doubt that almost perfect exactitude will ultimately be reached. Perhaps what astonished the legislative body most was the explosion of mines. The latter were 2,000 yards apart, and connected by an electric cable. At one end one of the mines was "bumped," and by means of the ingenious electrical apparatus which was made use of on the occasion one at the other end exploded almost simultaneously, sending up a huge volume of water, resembling a waterspout of large dimensions. This experiment was intended to illustrate the manner in which sunken mines, covering large areas, may be exploded from the shore when used for the defence of harbors, rivers, etc. Other experiments of a minor nature were also made, and afterwards the party proceeded to the turret ship Colossus at Spithead, and inspected the various minutiæ of that large vessel, which is fitted with all the latest developments which naval science can supply. Electricity is used to a very great extent on board this leviathan of the deep. It is, of course, fitted in every part with the electric light, has search lights of the most powerful and penetrating description, its turret is worked by electricity, and its guns fired by the same power. After this the members returned on shore, and left by train for London, after a holiday which the amenities of party politics must have transformed nto something delightful indeed.

### A Brave Climber.

During the recent severe storm in St. Louis it was observed at the Signal Office that the wind had disarranged the anemometer or wind gauge on the top of the cupola. This gauge consists of the little cups that catch the wind and spin around, communicating their movement to an electrical current that transmits it to a dial in the rooms below where it is recorded by an automatic. The recording of the wind's velocity is an important part of the record of a storm, and when the cups were found to be out of place it dawned on the observers that they had to be fixed. But the question was who would dare make the ascent in the midst of the fearful disturbance of the elements. The lightning was running in on the telegraph wires, the thunder shook the immense dome, and the wind, which was blowing in fearful gusts, threatened to sweep anybody off the cupola. Observer Kortz finally decided that it had to be done, and, buckling his old uniform about him, he bade farewell to his colleagues and started for the top. The danger began after the ascent was about three-quarters made, for then the plucky signal man had to forsake the interior of the cupola, clamber out through a little door eighteen inches square, whose door swung outward on its hinges, afforded a temporary platform, and from there climb to where the cups were standing still in the wind. As the door was pushed open and Kortz stood on the little door, his form revealed in the lightning flashes, his comrades below cheered, and as the solitary figure hesitated a moment one of them shouted: "The American uniform got nearest the North Pole, now you take it nearest the sky."

Through the roaring of the wind Kortz must have heard it, for in a few seconds he was balancing on the top of the cupola 256 feet from the ground, the object of all the lightning, wind and rain that played around the top. In a few moments he had adjusted the delicate instruments and was on his way down. As he reached the door opening into the interior a new danger awaited him. The little door had swung to and no longer afforded a foothold. It seemed impossible for him to get down without assistance. But he boldly grasped the situation. Clutching the cupola with both hands, and suspended in mid-air, he reached one foot down and kicked the door open, and then slid down hand-over-hand until he managed to get a brace for his foot on the door when he let himself through, and was soon standing below none the worse for his skyward journey except a good wetting.

—— The Winsted Gaslight Company, of Connecticut, has decided to replace 75 of its street gaslights with 24 electric lights.

—— The Electric Light Company at Beaver Falls will, as soon as a charter and the right of way are obtained, commence the erection of a plant in New Brighton, Pa. It is the purpose of the company to furnish light, power and fuel at the same rate as gas is now served. All the stock is taken, and the projectors are confident of success.

—— There is great rejoicing in Schenectady, this State, over the fact that the valuable McQueen locomotive shops have been purchased by the electric lighting company, and that a plant for the manufacture of electric lighting machinery will be established there. The price paid by the company was $37,500, to which public-spirited citizens have added enough to purchase the shops at $45,000. The works will commence, it is expected, with about 400 men, eventually increasing to 1,000.

—— The Birmingham (England) Town Council has decided to accept the tender of Messrs. Chamberlain and Hookham, a local firm, for the plant required for the introduction of the electric light into No. 2 Art Gallery. The gallery contains the collection of oil paintings by David Cox, presented to the town by the late Mr. J. H. Nettlefold, and one of the conditions of the bequest was that the gallery in which the paintings were placed should be lighted by electricity. The amount of the tender is £560, and the annual cost of maintenance is estimated at £100. The power will be supplied by a gas engine.

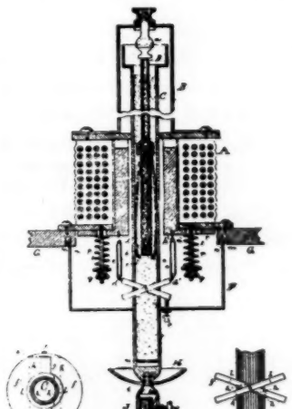
### Dr. Moses' Arc Lamp.

This lamp is one of a series invented by Dr. Otto A. Moses, of this city, application having been filed in 1883, patent issuing June 8, 1886. There are two novel features in the lamp, of which there appears a sectional view on this page. The clutch ring encircling the carbon carrier, instead of consisting of a single ring, is composed of two rings, or disks, pivoted one upon or within the other. The advantage in this is readily seen in always keeping the carbon contact central and firm. The other novel feature consists of an interposed section of non-heat-conducting material, shown at lower end of carbon-carrier, to prevent the conduction of heat from the carbon.

—— The building committee of the West Hotel, at Minneapolis, are investigating the workings of the different electric light systems of that city. They propose to light the hotel by electricity.

—— The Electric Lighting Company, of Rutland, Vt., has increased its capital stock from $5,000 to $50,000. This will be divided into 2,500 shares of $20 each, and be sold, as far as possible to Rutland business men. The increase was made, it is stated, to enable the company to put in an extensive plant for lighting the entire village. The company will buy two engines, of 125 and 75 horse-power respectively, the latter for use after the majority of the street lamps are shut off at midnight.

—— An excited meeting of the Rahway, N. J., Common Council took place the other night, over the contract for lighting the streets. For twenty-five years the Rahway Light Company have performed that service. About a year ago the Tesla Electric Gaslight Company established a plant in this city, and have perfected a very fine light. A unanimous report from the proper committee was brought in, recommending that the contract be given to the electric light company, although it increases the amount heretofore paid over $500. The contract was finally given to the Tesla company for two years.



NEW ARC LAMP, INVENTED BY OTTO A. MOSES, OF NEW YORK.

—— Investigations are still going on, particularly in France, with a view to utilizing the heat of the sun as a source of power and warmth. One of the most interesting and practicable methods in this line is that devised some time ago by Professor Morse, of Salem, Mass., the limitations of which, it is hoped, may be overcome by future improvements. This device consists simply of a shallow box, the bottom of which is of corrugated iron and the top of glass. This is placed outside the building in such a position that the sun shines directly upon it, the heat rays of the sun pass through the glass and are absorbed by the iron, heating it to quite a high temperature, and, by a system of ventilation, a current of air is passed through the apparatus and into the room to be heated. By this means the air was heated, on pleasant days, to about ninety degrees in passing over the iron. It is admitted, however, that the chief difficulty in all these methods of solar heating, as a substitute for the ordinary or artificial means, is yet to be overcome, being available only in fair weather, though, in connection with the customary system, a solar apparatus may effect a saving in the quantity of fuel usually consumed.

## ELECTRIC LIGHT NEWS

—— The Merchants' Electric and Illuminating Company, of Galesburg, Ill., with a capital stock of $20,000, has been organized.

—— Yonkers has rival electric-light companies, much to the delight of consumers, but possibly not to the stockholders.

—— Westfield, Mass., has just given the Schuyler Electric Light Company a contract, at $180 per year per lamp, for lighting its streets.

—— The machinery for the Denison (Texas) Electric Light and Power Company is being rapidly placed, and the works will be in operation in a short time.

—— The city council of Columbus, Ohio, has decided to visit the Western Electric Company, Chicago, to inspect that company's system of electric lighting.

—— The Sewickley Valley Electric Light Company, Sewickley, has been incorporated with a capital stock, $15,000. Treasurer, Robert D. McGonigle, Pittsburgh, Pa.

—— The wide-awake wire man is compelled to exercise his ingenuity in getting customers to be patient these days. When an electric light man wants wire, he wants it now.

—— The Brookline Electric Light Company, Brookline, Mass., have received their third Armington & Sims Co. engine this week. They will now be able to furnish 180 arc lamps.

—— The Mexico (Mo.) Schuyler Electric Light Company has entirely rebuilt its station, which was recently burned out, and replaced its former equipment with a complete Schuyler plant.

—— The Birmingham (Ala.) Gas and Electric Company has ordered, and will soon have in operation, a large Harris-Corliss engine which will furnish a capacity for running 200 electric lights.

—— It is stated that the firm of Grace & Co., of which the present Mayor of New York City is a member, have formed an association in Valparaiso to establish an incandescent electric light system there.

—— The citizens, to the number of 300, in certain parts of San Francisco, have signed a petition requesting more electric light. There had been some talk of depriving them of the lights already secured, and the gas company is blamed for the attempt.

—— The *Eagle* of that city claims that Wichita, Kansas, "is the best and cheapest lighted city in the State, and simply because she shut off all adventurers who were seeking franchises and privileges. We have not only the best gas works in the State, but two electric light plants, one the Thomson-Houston, and the other the Schuyler, with something upwards of 150 lights running. The streets are to be lighted with twenty-four arc-lights, contracted for, ten or twelve of which are going."

—— Prof. W. A. Anthony, of Cornell University, and a number of students, were recently highly entertained by the officers of United States Electric Light Company, in whose company they visited the Weston laboratory at Newark, and a number of the stations and plants of the company in this city, visiting the famous Stanton street station at night when it could be seen in full operation. The party were entertained at dinner by the United States Company's officers in the evening at French's hotel in the lunch rooms of the Electric Club and the following day were escorted through the Brush Company's station on Elizabeth street, the Western Union building, Day's Kerite establishment, and the Pearl street station of the Edison Company. The Professor and his pupils were all greatly pleased with their visit and the many attentions shown them by the electrical people with whom they came in contact.

# ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 15, 1886.

343,602 Induction coil; Gustav Pfannkuche and Alfred Pfannkuche, New York, N. Y.

343,603 Distribution of electric energy; Gustav Pfannkuche and Alfred Pfannkuche, New York, N. Y.

343,620 Electric belt for body wear; George A. Wright, Concordia, Kan.

343,642 Electro-automatic valve; Abraham S. Kissell, Chicago, Ill.

343,676 Electric cable; Sidney F. Shelbourne, New York, N. Y.

343,691 Automatic fire alarm; Wm. J. Baulieu, Bridgeport, Conn.

343,738 Signal call telegraph box; John E. Smith, New York, N. Y.

343,742 Key for telegraph instruments; George F. Thompson, Olean, N. Y., assignor of one-third to Edgar A. Adams, same place.

343,811 Electric arc-lamp; Valerian V. Golitzinsky and Paul O. Rymaschefski, Moscow, Russia.

343,863 Electric alarm apparatus; William C. Smith, New Haven, Conn.

343,868 Burglar alarm; James Tomney, New York, N. Y.

343,869 Burglar alarm; James Towney, New York, N. Y.

343,884 Electric railway; Edward M. Beatley, Brooklyn, N. Y.

343,886 Governor for electro-magnetic motors; Chas. F. Brush, Cleveland, Ohio.

343,930 Dynamo-electric machine; Samuel H. Tacy, New York, N. Y., assignor of one-half to James Boyce, Baltimore, Md.

344,939 Electric fence; David H. Wilson, St. Louis, Mo., assignor of one-third to Dent G. Tutt, same place.

343,953 Dynamo-telegraphy; Stephen D. Field, New York, N. Y., assignor to the Western Union Telegraph Co., same place.

343,976 Electric clock movement; Philip Lange, New York, N. Y., assignor to Edgar W. Moore, same place.

## BUSINESS NOTICE.

### To Members of the National Electric Light Association.

A meeting of the Executive Committee of this Association will be held at the Hotel Dam, New York, June 29. All persons who expect to prepare papers for the Detroit meeting, or who may have any facts of interest to the Association that they desire to present, are requested to notify the committee at this meeting; addressing as above.

A. J. DECAMP,
Chairman Executive Committee.

## SPECIAL NOTICE.

### National Electric Light Association,

**SEMI-ANNUAL MEETING.**

*THE FOURTH MEETING—semi-annual—of the NATIONAL ELECTRIC LIGHT ASSOCIATION will be held at DETROIT, MICH., on Tuesday, 31st day of August, at 10 o'clock, A.M. Dues being payable in advance, all members are required to forward the same for the year 1886, by check or otherwise, payable to the order of J. F. MORRISON, President, Baltimore, Md.*

*Electric Light Companies and Manufacturers of Electric Light Apparatus, Supplies, &c., desiring to become members, must apply on or before August 31st, to the President, J. F. MORRISON, Baltimore, Md.*

*Members and others desiring information as to R.R. transportation rates will address J. F. NOONAN, Esq., Chairman Com. on Transportation, Paterson, N. J.*

*Special Hotel rates will be made known previous to meeting of the Association.*

*A. J. DeCAMP, Chairman Ex. Com.*
*Philadelphia, Pa.*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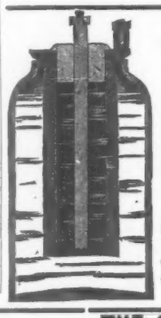

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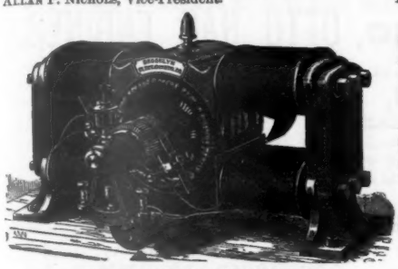

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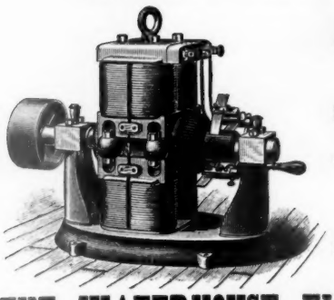

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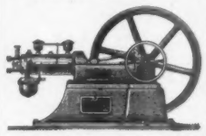

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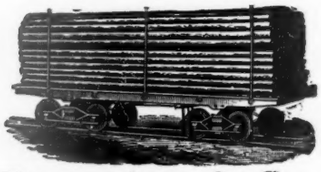

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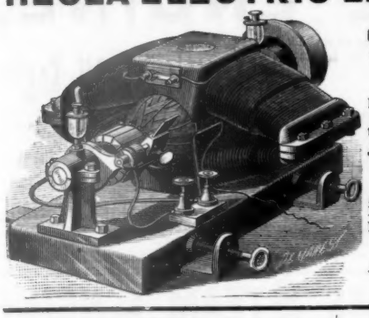

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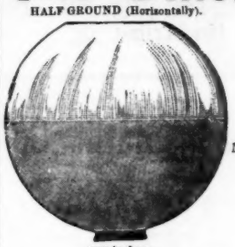

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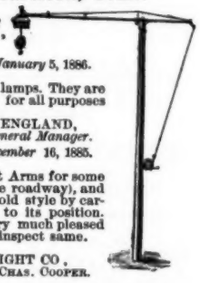

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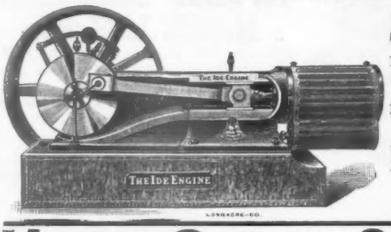


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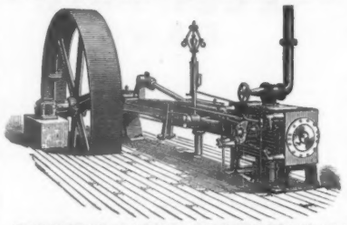

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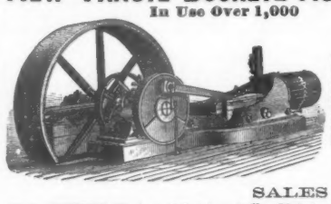

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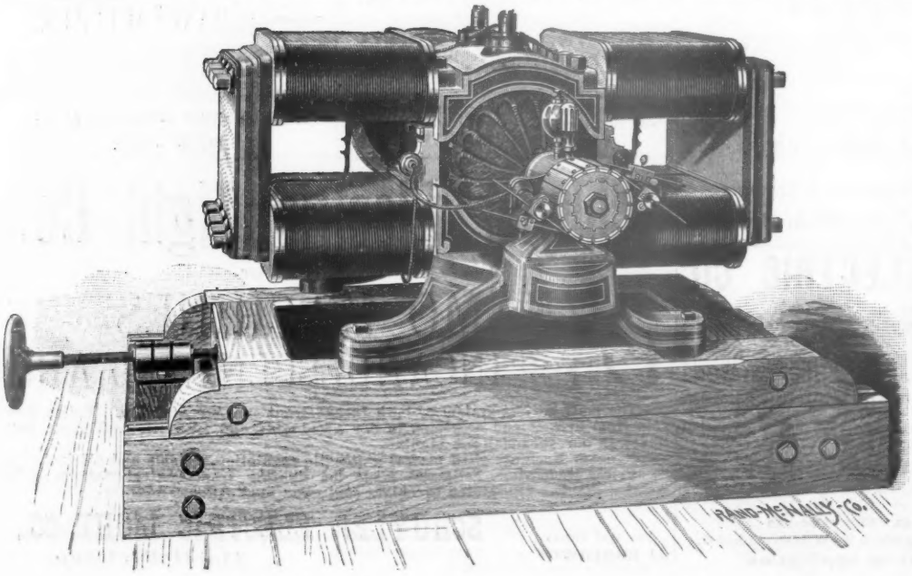


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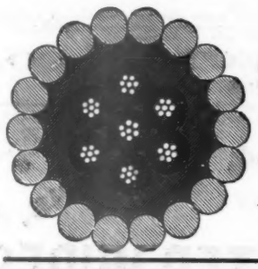

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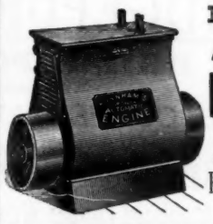

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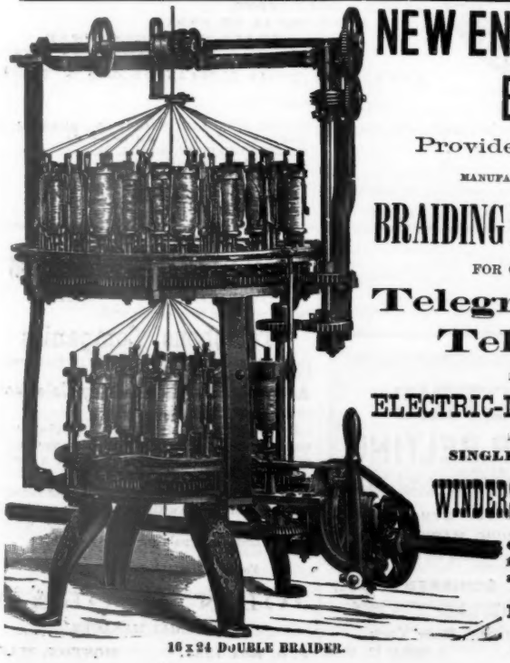

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